PETRA DANIŠEVSKÁ

Empirical Studies on Corporate Policies and Financial Intermediation

Empirical Studies on Financial Intermediation and Corporate Policies

Empirical Studies on Financial Intermediation and Corporate Policies

Empirische studies naar ondernemingsstrategie en financiële intermediatie

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Chapter 1

Introduction

1.1 Background

The European financial system has changed considerably over the past two decades. Dermine (2003) reviews factors that have had an impact on the development of the European banking sector during this period. He argues that a range of legislative changes, culminating in the introduction of euro, and other factors, such as worldwide integration, entry of new competitors, and information technology, have led to a considerable deregulation, consolidation and increased competition in European banking. While these changes are widely documented, it is interesting to study the impact of these developments on the established relations between banks and firms in Europe.

Traditionally, the European financial system has been characterized by the strong position of banks in the economy, which has allowed them to undertake investment-banking activities. The financing of firms has been largely dependent on the bank loans leading to so-called relationship lending, through which a bank acquires expertise about the credit-worthiness of a firm by keeping close contact with the firm's management. In recent years, some practitioners and researchers have claimed that the importance of firm-bank relationships has diminished. For example, Rajan and Zingales (2003) argue that in the last twenty years the European financial system has moved from the relationship-oriented bank-based system in the direction of the arm's-length market-based system. Their opinion is shared by Issing (2003), who suggests that the consolidation and increased competition in the banking sector have had a negative effect on relationship lending.

Interestingly, other researchers have come to opposite conclusions. For example, Hartmann, Maddaloni, and Manganelli (2003) assess corporate bond issuance in Europe. They argue that the increased issuance of corporate debt securities has not yet led to a regime shift in which market-based instruments to a significant extent substitute for loans and private equity as the primary means of corporate financing in continental Europe. Moreover, the European Central Bank in the "Report on financial structures" (2002) concludes its analysis of the financing of non-financial corporations in Europe with the following statement: "…taking into account the fact that banks in the euro area have expanded their role to encompass more market-oriented types of intermediation, as they would normally advise on and manage IPOs and the issuance of debt securities by corporations, it would seem that the financing of euro area companies remains in the hands of financial intermediaries."

In this thesis we contribute to this discussion by presenting four empirical studies on the role of financial intermediaries in the interaction between firms and investors. We consider therefore financial systems consisting of three groups of participants: firms, investors, and financial intermediaries. Firms search for and undertake profitable investment projects. The amount of internal sources that a firm generates is not always sufficient to finance these investments. The role of investors is then to provide external funds in the form of debt or equity. The investor concern is the degree to which the actions of managers follow their interests. The position of financial intermediaries in financial systems is between firms and investors. Financial institutions facilitate the flow of funds and help to overcome information asymmetry between firms and investors that might otherwise adversely affect the transfer of resources.

Firms face a range of investment opportunities. Their task is to evaluate the possible investment projects and pursue those that are most beneficial to the value of the firm. The investment decisions thus determine the composition and size of the firm's assets. Simultaneously, a firm must decide how to finance these investments. Besides internal sources, a firm can raise external funds from investors in the form of debt or equity. The academic literature has dedicated hundreds of pages in the search for the optimal capital structure. The journey started with the model of Modigliani and Miller (1958) claiming that capital structure does not affect the value of the firm under the assumptions of perfect capital markets. Subsequent modifications of this model introduced corporate and personal taxes, and costs associated with financial distress (Modigliani and Miller (1963), Miller (1977)). These extensions help to establish an optimal capital structure that trades off bankruptcy costs and tax benefits of debt. Later this trade-off has been extended by agency costs that principals (*e.g.*, bondholders) incur by monitoring and bonding actions of agents (*e.g.*, shareholders) with diverging interests and superior post-contracting information (Jensen and Meckling (1976), Myers (1977)). While these models focus on the ratio of debt to equity on a firm's balance sheet, adverse selection models (*e.g.*

Ross (1977), Myers and Majluf (1984)) investigate agency costs in the choice of the form of financing in the case of new security issues.

A firm that searches for external financing has to decide about the allocation of cash flow and control rights among investors. Compared to the traditional capital structure approach, the literature dealing with optimal security design does not take the set of contracts from which a firm can choose as given. This thesis addresses two characteristics of debt contracts: the maturity of debt and its source. In general, a firm can decide to issue short-term or long-term debt. The optimal debt maturity studies, similar to the traditional capital structure literature, take into account bankruptcy costs, taxation, and agency and adverse selection problems. A firm can obtain debt financing from multiple sources. The literature typically makes a distinction between a loan from a bank and a public bond issue. This choice between a public and a private source reflects different transaction costs involved, diverse abilities to closely monitor the actions of the borrower and the ease with which the contract can be renegotiated.

Empirical research confronts theory with practice. A vast literature aspires to explain the cross-sectional variation in observed capital structures using proxies for determinants suggested by theory. The quantitative insight was in recent years complemented by extensive surveys among chief financial officers in the U.S. (Graham and Harvey (2001)) and Europe (Brounen, de Jong, and Koedijk (2004)). The authors of the latter study provide the interesting observation that: "…in both the U.S. and European markets professionals tend to adopt and neglect the same theoretical models and theories when managing their finances." While the insights provided by the empirical literature are captivating and numerous, they tend to focus on one type of financing decision at the time. In practice, managers simultaneously make multiple choices. Their decisions concern the amount of debt financing, and specific features of debt contracts as discussed above. We address this gap in the literature in two chapters of this thesis, where we present two empirical studies on capital structure choices. Chapter 2 investigates how firms make the selection between short-term and long-term debt in a situation when managers know more than the market. Information asymmetry between corporate insiders and firm's lenders is an important assumption behind adverse selection theories. The empirical evidence on this topic is mixed (see Barclay and Smith (1995), and Stohs and Mauer (1996)), which can be attributed to the difficulty in measuring asymmetric information. We propose a methodology to measure information asymmetry concerning a firm's earnings in the short and long run. The study stresses that the debt maturity decision is much more relevant for firms with a high leverage ratio. Therefore, we control for leverage, which is endogenously determined in our model. In Chapter 3 we investigate three capital structure decisions in a simultaneous setting. We document how the choices of leverage, debt maturity and the source of debt relate to each other. We also examine the determinants of each of these decisions.

The second group of participants in the market are investors providing debt and equity financing to firms. They supply the funds in exchange of a promise of uncertain future returns on their investments. Corporate governance deals with the ways in which suppliers of finance to corporations assure themselves of getting a return on their investment (Shleifer and Vishny (1997)). The securities that investors buy from a firm specify their rights. Creditors are entitled to the cash flows of the company in the extent to cover the principal amount of the debt and interest on it. The control rights of debt holders are usually limited to the possibility of seizing assets or liquidating the firm when their loans are not fully repaid. Conditions under which they have the right to do so are explicitly written down in the debt contract. Shareholders, on the other hand, do not receive any guarantee for the repayment of their investment. However, they can exercise their control rights by voting during shareholder meetings. Their rights usually allow them to elect and remove management, and to (dis)approve major investment decisions. Institutional differences across countries lead to variations in possibilities of investors to exercise their rights and influence the actions of the management. For example, in the Netherlands, firms operate under a two-tier system, in which a supervisory (non-executive) board is a separate body with the task of monitoring the managerial (executive) board, chaired by the chief executive officer (CEO). Further, the supervisory board not only represents the interests of shareholders, but also of all stakeholders including a firm's lenders and employees. The effectiveness of these structures is enthusiastically discussed in both the academic literature and practice. We contribute to this debate in Chapter 4 by analyzing the incidences of personnel changes on supervisory and managerial boards in Dutch listed firms. We pay special attention to whether and when investors trigger the forced departures of CEOs and the market reaction to these events.

Another activity that investors undertake is valuation and pricing of their investments. The publicly available information complements their beliefs in estimating future values of firm fundamentals. The fact that investors in their process of evaluating and pricing possible equity investments can come to different conclusions leads us to another interesting research area. The theoretical asset pricing literature suggests that heterogeneity of beliefs among investors affects stock prices. Diether, Malloy, and Scherbina (2002) empirically test the hypothesis of Miller (1977) that stock prices will reflect a more optimistic valuation when pessimistic investors are kept out of the market by high short-sale costs. This price optimism model suggests that the bigger the disagreement about a stock's value, the higher the market price relative to the true value of the stock, and the lower its future returns. In Chapter 5 we explore this proposition in four major European stock markets and four different market situations.

So far, we have addressed the role of firms and investors in a financial system. However, financial intermediaries that stand between firms and investors play a major role in all four empirical studies of this thesis. We study how activities of banks and analysts

affect the funding and performance of firms. In general, the function of intermediaries is to reallocate the funds from the individuals that have excess of resources to economic units that lack them. The literature on financial intermediation (see *e.g.*, Freixas and Rochet (1997)) has long established the reasons why firms and investors cannot always directly interact with each other relate to transactions costs and asymmetric information. While the traditional banking business of taking deposits and making loans has decreased in recent decades, banks shifted their focus to fee-related operations. Other forms of financial intermediation, such as pension funds, have grown enormously. However, this general trend has not erased the regional differences in the position of banks vis-à-vis firms. In this thesis we investigate the role of banks, and other financial institutions in general, in firms' financing decision making and management disciplining in the Netherlands. The Dutch financial system is characterized by a strong position of large banks in the economy. The strength of this position is demonstrated, besides lending to firms, by equity participations, and bankers with supervisory board seats. Chapter 3, besides extending the capital structure literature, provides interesting and relevant insights into the firm-bank relations. We contribute to the relationship banking literature by linking the interests that a bank has in a firm to a firm's reliance on debt financing, and bank debt in particular. In Chapter 4 we show that the presence of bankers on the supervisory boards is critical for removing an underperforming chairman of a managerial board in the Netherlands.

Financial institutions and broker houses employ equity analysts, who serve as information intermediaries. Their role is to provide timely, accurate and unbiased information about the firms they follow to the customers. It has been widely acknowledged by the popular press and academic literature that this is not always the case.[1] Although the potential bias in analyst forecasts certainly deserves research attention, we demonstrate an interesting relationship between dispersion of individual analyst forecasts around the mean forecast and capital structure. Chapter 2 clarifies how dispersion in earnings per share and growth forecasts relates to the information asymmetry between a firm's managers and lenders in different horizons. The chapter further discusses the impact of information asymmetry on the debt maturity choice as explained earlier in this section. The second area where we apply the dispersion in analyst forecasts is asset pricing. In Chapter 5 we relate dispersion to the differences in investor opinions. We demonstrate that the relationship between the dispersion and cross section of European stock returns cannot be fully attributed to priced risk factors. Chapter 5 also provides ideas for future research especially related to the link between dispersion and stock returns in stock market bubbles.

[1] See, for example, "The Fall of the Net Analysts" (*Business Week*, December 11, 2000), "Requiem for an Honorable Profession" (*The New York Times*, May 5, 2002), and "What Earnings Recovery?" (*Forbes*, July 8, 2002). Lin and McNichols (1998), and Michaely and Womack (1999) investigate the conflicts of interest of analysts associated with the underwriters. Jegadeesh and Kim (2003) examine the value of analyst recommendations in G7 countries.

In this thesis we study how financial intermediaries relate to the capital structure policies and performance of firms. We stress that it is important to take into account the strong position of intermediaries between the firms and investors, instead of studying the two parties in the isolation.

1.2 Outline

The core of this thesis consists of four empirical studies. The focus is on the relationship between intermediaries, both financial and informational, and a firm's capital structure policy and performance. In this subsection we briefly discuss the set-up of each of the studies.

Chapter 2 examines the effect of asymmetric information between managers and lenders on debt maturity structure of firms. We analyze a sample of 457 U.S. listed non-financial firms from January 1994 to December 1999. This chapter provides the first empirical test of the Goswami, Noe, and Rebello (1995) model, which argues that firms with a large difference between information asymmetry concerning their short and long-term earnings prefer long-term debt. The measures of short and long-term asymmetric information are derived from the dispersion of analyst earnings forecasts. These proxies also enable us to improve the tests of debt maturity related adverse-selection theories. Other empirical studies find mixed evidence. We argue that the test of Flannery's (1986) signaling theory requires the identification of firms with both information asymmetry and positive news. Further, we investigate determinants of debt maturity suggested by several theories and include determinants selected by previous empirical studies to facilitate comparison of the results. The set-up of empirical model takes into account the endogeneity of leverage in the debt maturity decisions.

In Chapter 3 we investigate three capital structure decisions in a simultaneous setting. We use publicly available data for 205 Dutch firms listed during the ten-year period between 1992 and 2001. We analyze the relationships between decisions about leverage, debt maturity and the source of debt. Previous studies focus on a single decision or, at best, two decisions. We also control for other determinants of the three choices proposed by theoretical models. In the second part of the chapter we study how the capital structure decisions relate to the strength of the relationships that a firm has with banks. The Netherlands provide an excellent place to study the impact of banks on firms, because Dutch banks have a strong position and many relations with non-financial firms. Interlocking directorates and bank ownership of the firm's equity measure the strength of the firm-bank relationships. This study provides insights on the preference of banks for low risk customers (Carey, Post, and Sharpe (1998)). Further, we test whether firm-bank relations help to mitigate liquidity risk of the firms (Diamond (1991a)).

Chapter 4 concentrates on the board turnover in the Netherlands from 1992 to 1999. Dutch listed firms are governed by a two-tier system. The first tier is the executive board, also referred to as the managerial board. The second tier is the supervisory board, which consists of the non-executive directors. Dutch corporate law prescribes that the supervisory board is independent of the company and is responsible for the supervision of the managerial board. However, the anecdotal evidence questions the efficiency of this structure. We contribute to this discussion by analyzing the incidents of forced turnover on the two boards. Next, we examine the sensitivity of the forced turnover of CEOs to firm performance, and which forces drive this performance-turnover sensitivity. We also analyze the stock market reactions to the announcements of the departure of the board chairman.

Chapter 5 focuses on the relationship between differences of opinion and stock returns in Germany, France, the Netherlands, and the U.K. This study covers the period between January 1992 and July 2003. The theories suggest that the differences of opinion can have positive, negative, or no effect on the future stock returns. Following Diether *et al.* (2002) we measure differences in opinions by dispersion of analyst earnings forecasts. In total our sample contains almost two hundred thousand firm-month observations for over 3,000 firms. We allocate stocks to portfolios based on their dispersion, and measure the subsequent returns for different portfolio holding periods. Next, we assign stocks into groups based on one risk factor, such as size, book-to-market, and momentum, and the dispersion. This procedure aims to find out whether the differences in returns between low and high dispersion stocks can be attributed to one or more of these risk factors. This analysis is further extended by multifactor time-series tests. In the last section of the chapter we investigate the persistence of the dispersion-return relationship during different stock market situations.

Chapter 6 presents a summary and a conclusion of this thesis. In addition, we discuss potential avenues for future research.

Chapter 2

Is Debt Maturity Determined by Asymmetric Information about Short-term or Long-term Earnings?

2.1 Introduction

Since the seminal contribution of Modigliani and Miller (1958), theoretical models on capital structure have focused on loosening strict assumptions and investigating the relevance of capital structure for the value of the firm. After the debt maturity irrelevance proposition of Stiglitz (1974), theoretical studies on determinants of optimal debt maturity structure followed a similar path of introducing market imperfections. These theories deal, for example, with adverse selection (Flannery (1986), Diamond (1991a)), moral hazard (Myers (1977), Barnea, Haugen, and Senbet (1980)), and taxation (Brick and Ravid (1985), Kane, Marcus, and McDonald (1985), Brick and Ravid (1991)). The first tests of their empirical implications emerged as a by-product of studies that were interested in issues other than debt maturity (Titman and Wessels (1988), Mitchell (1991)). Barclay and Smith (1995) were among the first to specifically investigate determinants of the proportion of long-term debt to total debt. Stohs and Mauer (1996) extended the set of tested hypotheses and their debt maturity measure benefited from information on maturities of individual debt instruments. Other empirical studies examining debt maturity determinants are Guedes and Opler (1996), Ozkan (2000) and Scherr and Hulburt (2001).

Information asymmetry between corporate insiders and firm's lenders is a crucial assumption in adverse-selection agency theories explaining optimal debt maturity choice. For example, Flannery (1986) suggests that firms with favorable private information will signal their quality by issuing short-term debt. The empirical evidence on signaling is very mixed. Stohs and Mauer (1996) and Guedes and Opler (1996) find the expected negative relation between firm's earnings surprises and debt maturity. On the other hand, little or no support is provided for this relation by Barclay and Smith (1995), Ozkan (2000) and Scherr and Hulburt (2001). These contradictory conclusions are likely to be explained by the serious problem of measuring asymmetric information. This also clarifies why empirical implications of Goswami *et al.* (1995) have not been tested yet. Their model suggests that firms that have a large difference between information asymmetry concerning their short and long-term earnings prefer long-term debt. Short-term debt is optimal for firms with asymmetric information similar for both short and long-term earnings. When we test adverse selection models, it is important to keep in mind that the degree of asymmetric information varies among firms. A firm with positive news about its value, which is subject to low information asymmetry, has no reason for signaling. Such a firm might be indifferent between short-term and long-term debt. On the contrary, issuing a short-term debt is an optimal action for a firm with *both* positive (inside) information *and* a high degree of asymmetric information about its future earnings.

The contribution of this study is in testing the effects of asymmetric information on a firm's debt maturity structure. Our proxy of asymmetric information allows us to explicitly test hypotheses concerning adverse selection models. Further, we introduce measures of asymmetric information concerning firm's short-term earnings as well as long-term earnings. Given the knowledge about the asymmetric information over both short and long-term horizons, we are able to investigate the so far untested empirical implications of Goswami *et al.* (1995). Our measure of asymmetric information is based on the dispersion of analyst earnings forecasts around the mean forecast for a given firm. The idea behind this variable is that a lack of consensus among the analysts about the future earnings of the followed firm suggests a lack of firm-specific information. This measure is available from the Institutional Brokers Estimate System (I/B/E/S). I/B/E/S provides (among others) forecast dispersions for one-year ahead earnings, but also for the five-year growth of earnings. In this way, we obtain measures of asymmetric information for the short and long horizons. Previous research of analyst forecasts provides strong evidence that the dispersion of one-year-ahead earnings forecasts reflects the availability of firm-specific information (see Lang and Lundholm (1996), Goss and Waegelein (1993), Sant and Cowan (1994)). The only empirical study in corporate finance using the one-year ahead forecast dispersion is Krishnaswami and Subramaniam (1999). Their examination, however, does not use the short-term dimension of this measure (the short-term feature of the measure does not provide any additional information for their analysis). The forecast

dispersion of long-term growth of earnings has received extremely limited attention so far in the research of analyst forecast (Goss and Waegelein (1993)) and has not been applied yet by any empirical study in corporate finance.

In this paper, we collect data for a sample of 457 U.S. non-financial firms over the period from 1994 to 1999. We empirically examine determinants of debt maturity suggested by several theories and include determinants selected by previous empirical studies to facilitate comparison of the results. Our main focus is, however, on the effect of short and long-term information asymmetry on debt maturity structure. Our results provide no support for Goswami *et al.* (1995). Firms that are subject to the largest difference in their asymmetric information concerning their short-term and long-term earnings do not issue a higher proportion of long-term debt. Next, we focus on short-term asymmetric information. We demonstrate that firms with both information asymmetry and positive information rely more on short-term debt. This evidence is consistent with Flannery's (1986) signaling theory.

Finally, we document the importance of controlling for leverage in the empirical debt maturity studies. Our results provide robust evidence for the positive effect of leverage on debt maturity. This result is consistent with Diamond (1991a) where firms with high leverage optimally issue long-term debt in order to avoid suboptimal liquidation. There is no evidence that firms with high leverage decrease their debt maturity in order to mitigate Myers' (1977) underinvestment problem. Finally, the estimated coefficients on firm size and its square provide strong support for the nonmonotonic relationship between the firm's credit quality and its debt maturity, where the best and worst credit-quality firms obtain short-term debt and the intermediate borrowers issue long-term debt.

The remainder of this chapter is organized as follows. In the next section we briefly review the theories and previous empirical studies and develop testable hypothesis. In section 2.3, we describe sample selection process and variables definitions. The results of empirical analysis are discussed in section 2.4. Section 2.5 concludes.

2.2 Debt maturity structure theories and hypotheses

The debt maturity structure is irrelevant for firm value under perfect market assumptions (Stiglitz (1974)). Subsequent theories have focused on the introduction of market imperfections and their effect on optimal debt maturity structure. In this section we review the theories where information asymmetry between corporate insiders and firm's lenders has a prominent position. Other theories and their empirical implications are also briefly discussed.[2] An overview of theories, determinants and the hypothesized effects is provided in Table 2.1. In the last part of this section we summarize previous empirical studies.

[2] See Ravid (1996) for an extensive survey of literature on firm debt maturity.

Table 2.1: Theories and determinants

This table summarizes debt maturity theories, determinants and hypotheses.

Theories	Determinants	Hypotheses
Adverse-selection and signaling	Positive news under information asymmetry	H1 (-)
	Risk of liquidation	H2 (non-linear)
	Public debt market access	H3 (+)
	Leverage	H4a (+)
	Term structure of asymmetric information	H5 (+)
Moral hazard	Growth opportunities	H6 (-)
	Leverage	H4b (-)
	Asset maturity	H7 (+)
	Asset value volatility	H8a (-)
	Firm size	H9 (+)
	Regulation	H10 (+)
Tax effects and asset risk	Marginal tax rate	H11a (-), H11b (0)
	Asset value volatility	H8a (-), H8b (+)

2.2.1 Adverse selection and signaling

Adverse selection models analyze contracts between parties possessing different information at the time of the arrangement of the contract. In case of debt contracts, management has exclusive knowledge concerning firm's prospects in contrast to the information possessed by the firm's lenders or bondholders.

In Flannery (1986), information asymmetry concerns the project quality. The debt issues are valued as if they have average quality, because the market cannot distinguish issuers with good and bad projects. Firms with high quality projects prefer short-term debt, because it is less undervalued than long-term debt. A separating equilibrium exists when firms with bad projects are not able to mimic the behavior of firms with good projects. Such a situation arises when the transaction costs of revolving the short-term debt exceed the overvaluation of bad firm's short-term debt. Then firms with unfavorable private information issue long-term debt. The empirical implication of this model is that firms with high degree of asymmetric information and good (bad) news issue short-term (long-term) debt (see hypothesis H1 in Table 2.1). Firms without information problems are expected to be indifferent, no matter what their prospects are. Kale and Noe (1990) show that Flannery's (1986) separating equilibrium does not require transactions costs. The same results are obtained if the nature of the ex post released news is correlated over time. On the other hand, all firms regardless the project quality issue long-term debt if interest rates are uncertain and costs of financial distress are considered (Titman (1992)).

In Diamond (1991a), the optimal debt maturity structure is a trade-off between the preference for short-term debt, when borrowers expect their credit quality to improve

(positive inside information), and liquidity risk. Liquidity risk represents a risk that borrowers lose control rents, which cannot be assigned to lenders, when lenders do not refinance the short-term debt due to a decrease of rating resulting from bad information disclosure. The testable implication is a nonmonotonic relation between the debt maturity and a proxy for borrower's credit quality (H2). The highest-quality borrowers have a very small probability of receiving a large downgrade that leads to their liquidation. The liquidity risk is thus outweighed by better expected terms of refinancing of a short-term debt. In case of intermediate borrowers, even a small downgrade might result in liquidation and therefore long-term debt will be preferred. The worst borrowers cannot obtain long-term debt. They have to issue short-term debt, although it increases the probability of liquidation and loss of control rents. Beside the high risk borrowers, also firms without the access to the public debt market are expected to rely more on short-term debt (H3). For the purpose of empirical testing, Johnson (2003) suggests that increasing liquidity risk by issuing short-term debt is comparable to increasing expected bankruptcy costs, which decrease optimal leverage. Therefore we expect a positive effect of leverage on debt maturity (H4a).

The model of Goswami *et al.* (1995) differs from the above-mentioned theories by introducing the term structure of asymmetric information. Their model suggests that the difference in the degree of asymmetric information concerning a firm's short-term and long-term cash flows influences the choice of maturity. A firm optimally issues long-term debt with coupon and limited payouts of dividends when there is a relatively high degree of uncertainty regarding long-term cash flows. If there is more asymmetry of information about short-term cash flows and a firm could face a refinancing risk, then it is better off financing its project by issuing a long-term debt with coupon and unrestricted payouts of dividend. When there is an equal degree of information asymmetry related to both short and long-term cash flows, a firm issues short-term debt. Given the lack of public information concerning debt covenants, the empirical implication is that firms with large difference between their short-term asymmetric information and long-term asymmetric information should rely more on long-term debt (H5). Similar information asymmetry concerning short-term and long-term cash flows is expected to lead to higher proportions of debt with short maturity.

2.2.2 Moral hazard

Myers (1977) argues that the under-investment problem can be mitigated by shortening debt maturity. In Myers' model, the value of a firm consists of the value of the assets in place and the present value of the growth opportunities, which represent options to undertake investments in the future yielding return in excess of the opportunity cost of capital. If such an investment is not made, the option expires and the firm value is reduced. These are the costs of the under-investment problem. Why should managers behave in

such a way? In firms with risky debt, managers acting in the interest of shareholders might pass up the investment opportunity if undertaking it would reduce the wealth of shareholders. Such a situation occurs when the debt payment exceeds the difference between the value of the newly obtained asset and the initial investment to obtain the asset. This situation is however avoided if the debt matures before the investment option expires. The empirical implication is that firms' short-term borrowing is positively related to their growth opportunities and leverage (H6 and H4b). Myers (1977) also provides reasoning for maturity matching of firm's assets and liabilities. In his model, matching the debt payments with the decreasing future value of assets in place can mitigate the under-investment problem. In empirical tests, we expect to observe firms that have a larger proportion of assets with short lifetime in their asset structure to rely to a larger extent on short-term debt (H7).

The intentions of shareholders to increase their payoffs by increasing the project risk − the asset substitution problem − can be mitigated by issuing short-term debt. The value of short-term debt is less sensitive to shifts in the variation of project cash flows in comparison with long-term debt as suggested by Barnea *et al.* (1980) (H8a). Smith and Warner (1979) suggest that small firms are more susceptible to this problem. Therefore we expect a positive relation between the firm size and debt maturity (H9). Finally, Barclay and Smith (1995) argue that because regulated firms have less discretion in investment decisions, which leads to lower agency costs of long-term debt, they should have more debt with longer maturities than unregulated firms (H10).

2.2.3 Other theoretical models

Empirical testing of taxation theories is problematic due to different sequences of financing decisions. In Brick and Ravid (1985) leverage decision precedes debt maturity choice. Their model shows that when the term structure of interest rates is upward sloping, it is optimal to issue long-term debt because the present value of the tax shelter will be highest (H11a). Long-term debt will be also optimal in case of stochastic interest rates that have increasing, flat or even decreasing term structures (Brick and Ravid (1991)). Lewis (1990) on the other hand models leverage and debt maturity choices simultaneously and derives that taxes are irrelevant for the debt maturity decision (H11b).

Kane *et al.* (1985) suggest that optimal debt maturity is negatively related to volatility of firm value. They extend the tax-bankruptcy trade off by considering the costs of issuing debt. In their model the tax advantage of debt negatively affects debt maturity, because the decrease in the tax advantage of debt requires longer debt maturity in order to amortize flotation costs (H11a). Further, debt maturity will optimally decrease with increasing asset value volatility due to a higher probability of bankruptcy and the need to rebalance the capital structure more frequently (H8a). Wiggins (1990) finds a positive effect of asset risk on debt maturity in a model without transaction costs (H8b). Ravid

(1996) argues that different assumptions concerning the treatment of tax shelters in default state are behind the opposite implications of the two models.

2.2.4 Previous empirical results

The first tests of hypotheses related to debt maturity emerged as a by-product of studies that were primarily interested in other issues than debt maturity (*e.g.* Titman and Wessels (1988), Mitchell (1991)). Barclay and Smith (1995) were among the first to specifically investigate determinants of the proportion of long-term debt to total debt for a sample of U.S. industrial firms in a period from 1974 to 1992. They find that small, unregulated firms and firms with future growth opportunities issue significantly more short-term debt, which is consistent with theories that relate optimal debt maturity to the mitigation of agency costs of debt. Asymmetric information-based theories receive only mixed support. High quality firms (proxied by abnormal stock returns) do not rely on short-term debt significantly more than lower quality firms, which contradicts the Flannery's (1986) signaling model. On the other hand, the nonmonotonic relationship between the firm's credit rating and debt maturity (Diamond (1991a)) is confirmed. No evidence is found in support of the tax related hypothesis.

Stohs and Mauer (1996) extend the set of tested hypotheses and their debt maturity measure benefited from information on maturities of individual debt instruments for a sample of 328 U.S. industrial firms over a period from 1980 to 1989. They find only limited support for the agency cost hypothesis. Leverage is positively correlated with debt maturity and negatively correlated with the proxy for growth opportunities (the market-to-book ratio). When leverage is included in the regression, no relation is found between debt maturity and growth opportunities. Large firms are reported to employ more long-term debt. The higher the quality of a firm (proxied by earnings surprises) the shorter the debt maturity, which is interpreted as consistent with the signaling hypothesis. It is also confirmed that firms with the highest and lowest bond ratings tend to rely more on debt with shorter maturity. Strong support is found for maturity matching hypothesis as asset maturity is significantly and positively related to debt maturity. Tax hypotheses receive mixed support. Debt maturity structure is inversely related to effective tax ratio and earnings variability. The slope of the term structure of interest rates does not seem to influence the choice of debt maturity. Empirical studies that followed afterwards focused on the determinats of marginal maturity decisions (Guedes and Opler (1996)), non-U.S. samples (Ozkan (2000), Antoniou, Guney, and Paudyal (2002)) and small firms (Scherr and Hulburt (2001)).

In more recent papers, the research interest moves from the study of determinants of debt maturity to the investigation of relationships between various capital structure decisions in a simultaneous framework. Barclay, Marx, and Smith (2003) find a negative effect of leverage on debt maturity and a positive effect of debt maturity on leverage.

While the first result is attributed to the substitution of leverage and debt maturity in mitigating moral hazard problems, the latter is mentioned to be puzzling. Johnson (2003) addresses whether short-term debt alleviates the negative effect of growth opportunities on leverage. The author reports a mutually positive relationship between leverage and debt maturity, which is explained by the liquidity risk impact of short-term debt on leverage.

2.3 Data and variable definitions

In this section we first describe our sample selection criteria. Then we define our variables. We begin our sample selection with U.S. firms included in the Institutional Brokers Estimate System (I/B/E/S) in a period from 1994 to 1999 and having complete observations for the given year. Following Barclay and Smith (1995) and Stohs and Mauer (1996) we limit our attention to non-financial firms (SIC codes other than those beginning with 6). From this initial sample we exclude firm-year observations for which any of the explained or explanatory variables is missing in Worldscope. Finally, our explained variable presumes existence of debt in the firm's capital structure, and therefore we omit firms with no debt. This sample selection process results in the final sample of 457 firms with 2081 firm-year observations.[3]

In our regressions, *debt maturity* is the explained variable. Worldscope provides information about the amount of firm's short and long-term debt. We proxy debt maturity as the proportion of long-term debt (*i.e.* debt with maturity in more than one year) to total debt, which includes short and long-term debt. The reason for selecting one year as a distinction between short and long-term debt is that it corresponds to how short and long-term asymmetric information is defined and therefore serves the best the purpose of this paper (*i.e.* to examine the impact of the term structure of asymmetric information on debt maturity). Barclay and Smith (1995) and Ozkan (2000) employ a similar measure of debt maturity. Stohs and Mauer (1996) calculate their debt maturity measure from maturities of individual debt instruments. We cannot construct such a proxy due to lack of data.

The asymmetry of information between firm's insiders and their lenders is a crucial assumption behind debt-maturity adverse-selection models. The tests of empirical implications of these models face very serious difficulties of measuring asymmetric information between managers and financiers. This explains why the theoretical model of Goswami *et al.* (1995), requiring measurement of both short and long-term asymmetric information, has not been empirically tested yet. We proxy *short-term asymmetric information* with the coefficient of variation of one-year-ahead earnings-per-share forecasts (F1CV in I/B/E/S database definition). The intuition behind this measure is that

[3] Using only firms with complete data for the whole period of 1994-1999 would yield only 206 firms, which could bias our sample towards more mature and stable firms. This is not desirable given our focus on the effects of varying asymmetric information among firms and in time on debt maturity.

the more the individual analyst forecasts for a given firm are dispersed around the consensus forecast, the greater the shortage of firm-specific information. However, the earnings forecasts for firms with higher volatility of past earnings are also more likely to have a higher variation. Therefore we always control in the regressions for the volatility of earnings measured over last five years to separate the effects of asymmetric information and earnings volatility on debt maturity. The research of analyst forecast provides evidence that forecast dispersion reflects the availability of firm-specific information (see Lang and Lundholm (1996), Goss and Waegelein (1993), Sant and Cowan (1994)). The only empirical study in corporate finance using this measure we are aware of is Krishnaswami and Subramaniam (1999).[4] The short-term dimension of this measure is however not employed in their analysis.

As a measure of *long-term asymmetric information* we employ another forecast dispersion variable included in the I/B/E/S database – the standard deviation of the anticipated annual growth rate in earnings per share over a five-year period (LTSD in I/B/E/S database definition). This variable has received extremely limited attention so far in the research of analyst forecasts and has not been applied yet by any empirical study in corporate finance.[5] Because it has a similar interpretation as a short-term measure (a forecasted growth rate can be transformed into an earnings forecast) it can be used to proxy asymmetric information and the five-year period, over which it is measured, allows us to call it a "long-term" measure.[6] We collect the data for the short and long-term asymmetric information from the I/B/E/S database. For each firm and year *t* the data are as of 31st May in year *t* to make sure that the reported forecasts are for the year-end *t* and not *t-1*.

The disadvantage of our short and long-term measures of information asymmetry is that it is by the definition only available for firms with at least two analysts following. Given the strong evidence of a positive relation between the firm size and the number of analysts following (Lang and Lundholm (1996)), the above described sample selection procedure might lead to a disproportionate focus on large firms. We will return to this issue when we discuss the summary statistics for our sample.

Proxies for other explanatory variables are selected such that they test theories discussed in the previous section and are in accordance with those employed by earlier empirical studies to enable the comparison of results. We measure *firm size* as the natural logarithm of the book value of total assets. Firm size and its square are employed to test the nonmonotonic relation between firm's *credit quality* and debt maturity suggested by Diamond (1991a). Next to it, we include a dummy variable, which equals one if the firm's

[4] Krishnaswami and Subramaniam (1999) use additional four measures of information asymmetry. We do not use them, because they do not allow us to test the effects of term structure of asymmetric information on debt maturity.
[5] See Goss and Waegelein (1993).
[6] This measure is not an average of annual forecasts over five years, but a real five-year forecast of the analysts. It is available also for firms that lack some of the annual forecasts.

debt obtained a *S&P rating*, zero otherwise. Information about bond ratings are collected from Standard and Poor's Stock and Bond Guide (editions 1994-2000). The firms without the credit ratings are assumed to be either the worst creditors, or borrowers without access to the public debt market, which in both cases limits their possibility to obtain long-term debt (Johnson (2003)).[7]

The market-to-book ratio proxies firm's *growth options* in the firm's opportunity investment set. The market-to-book ratio is a ratio of the market value of assets to the book value of assets. We estimate the market value of assets as a book value of assets plus the difference between the market value of equity and the book value of equity. To test the hypothesis that firms match *the maturity of assets* and liabilities, we estimate the asset maturity similar to Stohs and Mauer (1996) as the book value weighted average of the maturities of current assets and net property, plant and equipment. The maturity of current assets is calculated as a ratio of current assets to costs of goods sold. In estimation of the maturity of net property, plant and equipment we assume straight line depreciation and calculate a ratio of net property, plant and equipment to annual depreciation expense.

To capture the nature of the insiders' private knowledge (*i.e.* good or bad news in signaling models), we use *future abnormal earnings* as a proxy similar to those used in previous empirical studies (Barclay and Smith (1995), Stohs and Mauer (1996)). Assuming that annual earnings follow a random walk, future abnormal earnings in year *t* are defined as earnings per share in year *t+1* less earnings per share in year *t* divided by the end of year *t* share price.[8] A firm's *effective tax rate* is measured as a ratio of income tax paid to pretax income. The reason for employing this explanatory variable is to facilitate the comparison of our results with previous studies that included effective tax rate as an explanatory variable (Stohs and Mauer (1996), Ozkan (2000)).

Following Johnson (2003), we construct a dummy variable that equals one if the firm is regulated (SIC between 4900 and 4939), and zero otherwise. *Volatility* of firm's earnings is used as a control variable to correct for effects that volatility of earnings might have on dispersion of analyst forecasts. The volatility of earnings in year *t* is measured as the standard deviation of the first differences in earnings before interest, depreciation and taxes over the period from *t* to *t-4* scaled by the average of the total assets from *t* to *t-4* (Stohs and Mauer (1996)). Finally, we define *leverage* as a ratio of total debt to the book value of total assets.

[7] For the firms that have debt with a credit rating, we do not use the actual bond rating. The reason is that the ratings are issued for different debt instruments and moreover, different bond issues of the same firm can be rated differently. For example, Ritchie (1997) claims that convertible issues are usually rated one class below that of the straight debt issues. This creates a problem with aggregating the ratings for each firm and comparing them across the sample.

[8] The random walk behavior of annual earnings is supported by studies in accounting, *e.g.* O'Brien (1988).

2.4 Empirical results

This empirical section aims at testing hypotheses regarding the debt maturity and its determinants with focus on asymmetric information about short and long-term earnings. In the first part, we present summary statistics for the full sample and four subsamples based on high and low short and long-term asymmetric information. In the second part the empirical models and regression results are discussed.

2.4.1 Summary statistics

In Table 2.2 we report descriptive statistics for the pooled time-series cross-sectional data containing 2081 firm-year observations. Before calculating these summary statistics, extreme values of observations were truncated. The extreme values, defined as exceeding the boundary of the median plus/minus four times the standard deviation, were truncated at the boundary value.

In Table 2.2 we find that the median proportion of long-term debt to total debt is 86%. The average of the book value of total assets is about $3.7 billion. The average market-to-book ratio of 2.39 is much higher than the 1.34 in sample of Stohs and Mauer (1996). This difference is most likely explained by the difference in sample periods, which in their case is from 1980 till 1989 (1994 to 1999 for our data). Also asset maturity is on average 6.89 years in our sample, which is much higher than the 4.7 years documented by Stohs and Mauer (1996). Both measures of asymmetric information are standardized. Before that short-term asymmetric information was on average 7.129 with standard deviation of 13.279 and long-term asymmetric information had a mean of 3.304 and standard deviation of 2.744. The correlation between the short-term and the long-term measures of asymmetric information is 0.28, which is statistically significant at the 1% level. The effective tax rate is on average 35.7%. More than half of the firms (54.2%) in our sample have in the given year a debt rating assigned by S&P.[9] This figure is comparable to the 55.5% in Stohs and Mauer (1996). Next, 14.8% of the firms were regulated in the period between 1994 and 1999. Finally, the average firm-year observation in the sample has volatility of earnings of 0.032 and a ratio of total debt to the book value of total assets of 0.274.

[9] According to the S&P Stock and Bond Guide (page XV of Introduction, edition 1999) this is due to: "…no public rating has been requested, there is insufficient information on which to base a rating, or that Standard & Poor's doe not rate a particular type obligation as a matter of policy."

Table 2.2: Summary statistics

This table shows summary statistics for the pooled time-series cross-sectional data. The sample consists of 2081 firm-year observations over the period from 1994 to 1999. Debt maturity is the ratio of long-term debt to total debt. Firm size is measured as the natural logarithm of the book value of total assets. Market-to-book ratio is the ratio of the market value of equity plus the book value of assets less the book value of equity to the book value of assets. Asset maturity is measured as the book value weighted average of the maturities of current assets and net property, plant and equipment. Short-term asymmetric information is the coefficient of variation of the one-year ahead earnings per share forecasts. Long-term asymmetric information is the standard deviation of the anticipated annual growth rate in earnings per share over a five-year period. Both measures of asymmetric information are standardized. Effective tax rate is the ratio of income tax paid to pretax income. Volatility is measured as the standard deviation of the first differences in earnings before interest, depreciation and taxes scaled by the average of the total assets over period *t* to *t-4*. Rated is a dummy variable that equals one if the firm's debt has a S&P bond rating, and zero otherwise. Regulated is a regulated firm dummy, equal to one for firms with SIC codes between 4900 and 4939, and zero otherwise. Future abnormal earnings in year *t* are defined as the earnings per share in year *t+1* less the earnings per share in year *t* divided by the end of year *t* share price. Leverage is the ratio of total debt to the book value of total assets.

Variables	Mean	Median	Standard Deviation	Minimum	Maximum
Debt maturity	0.790	0.860	0.224	0.000	1.000
Firm size	15.129	15.145	1.329	10.216	19.434
Market-to-book ratio	2.390	1.689	2.027	0.809	13.677
Asset maturity	6.890	4.703	6.012	0.202	40.495
Short-term asymmetric information	0.003	-0.301	0.999	-0.568	8.512
Long-term asymmetric information	0.003	-0.252	0.996	-1.284	6.304
Effective tax rate	0.357	0.368	0.148	0.000	1.000
Volatility	0.032	0.020	0.036	0.000	0.200
Rated	0.542	1.000	0.498	0.000	1.000
Regulated	0.148	0.000	0.356	0.000	1.000
Future abnormal earnings	0.006	0.006	0.064	-0.381	0.396
Leverage	0.274	0.276	0.156	0.000	0.948

In this study we investigate the impact of information asymmetries on debt maturity. Therefore, we compare firm characteristics of firms with high and low asymmetric information. The results of the *t*-test for equality of means are reported in Table 2.3.

In Panel A of Table 2.3 we investigate differences between firms with high and low short-term asymmetric information. A firm with high (low) short-term asymmetric information is defined as having a value of its short-term asymmetric information above (below) the 75^{th} (25^{th}) percentile in the particular year. An average firm with high short-term asymmetric information has a debt maturity of 0.847. This is by 0.092 higher than the average debt maturity of a firm with low short-term asymmetric information (0.755). The difference between the average debt maturities is significant at the 1% level.

Table 2.3: Summary statistics for subsamples with high and low asymmetric information in short and long-term

This table shows summary statistics for two subsamples based on the short-term and long-term asymmetric information. High (low) asymmetric information is defined as in the highest (lowest) quartile of the distribution. The variables are defined in Table 2.2. The symbol '***' denotes that the difference in means is significant at the 1% level; '**' at the 5% level; '*' at the 10% level.

	High asymmetric information		Low asymmetric information		Difference in means	*p*-value
	Mean	Median	Mean	Median		
Panel A: Short term asymmetric information						
Debt maturity	0.847	0.917	0.755	0.834	0.092***	0.000
Firm size	15.071	15.073	15.089	15.138	-0.018	0.828
Market-to-book ratio	2.017	1.484	2.920	2.170	-0.903***	0.000
Asset maturity	6.924	5.808	6.018	3.918	0.906***	0.007
Effective tax rate	0.347	0.362	0.360	0.371	-0.013	0.218
Volatility	0.053	0.041	0.021	0.012	0.032***	0.000
Rated	0.577	1.000	0.516	1.000	0.061**	0.046
Regulated	0.036	0.000	0.136	0.000	-0.100***	0.000
Future abnormal earnings	0.014	0.010	0.003	0.006	0.011**	0.011
Short-term asymmetric information	1.008	0.397	-0.450	-0.443	1.458***	0.000
Long-term asymmetric information	0.657	0.320	-0.332	-0.530	0.989***	0.000
Leverage	0.294	0.288	0.244	0.240	0.050***	0.000
Number of observations	525		516			
Panel B: Long term asymmetric information						
Debt maturity	0.821	0.910	0.791	0.851	0.030**	0.025
Firm size	14.690	14.729	15.363	15.398	-0.673***	0.000
Market-to-book ratio	2.817	1.794	2.049	1.496	0.768***	0.000
Asset maturity	6.201	4.595	8.889	5.988	-2.688***	0.000
Effective tax rate	0.333	0.355	0.358	0.368	-0.025***	0.006
Volatility	0.052	0.037	0.019	0.011	0.033***	0.000
Rated	0.468	0.000	0.508	1.000	-0.040	0.205
Regulated	0.025	0.000	0.376	0.000	-0.351***	0.000
Future abnormal earnings	0.007	0.008	0.003	0.004	0.004	0.310
Short-term asymmetric information	0.495	-0.026	-0.241	-0.370	0.736***	0.000
Long-term asymmetric information	1.290	0.889	-0.804	-0.778	2.094***	0.000
Leverage	0.256	0.241	0.301	0.322	-0.045***	0.000
Number of observations	523		516			

Although this analysis does not take into account the potential effects of other variables on the debt maturity, the results suggest a positive relation between short-term information problems and maturity. Firms with high short-term asymmetric information have, in comparison with firms with low short-term asymmetric information, more volatile earnings, more debt in their capital structure and are less likely to be regulated. Besides,

higher asymmetric information is related to longer asset maturity, higher future abnormal earnings and higher likelihood of rated debt, and lower market-to-book ratio. Finally, short-term and long-term asymmetric information seems to be positively related. Firms with high (low) short-term information asymmetry have also significantly higher (lower) asymmetric information in the long run.

In Panel B of Table 2.3, we describe differences between firms with high and low long-term asymmetric information. Similar to Panel A, higher long-term asymmetric information leads on average to higher proportion of long-term debt in total debt. Firms with high long-term asymmetric information are on average smaller with higher growth opportunities (proxied by market-to-book ratio), lower asset maturity and leverage. Firms with low long-term asymmetric information have on the other hand significantly less volatile earnings and are more likely to be active in a regulated industry. The results in Panel B of Table 2.3 also suggest positive relationships between asymmetric information in the two horizons.

2.4.2 Regression results

In order to test the hypotheses developed in section 2.2 we begin by estimating an OLS regression using our pooled sample of 2081 firm-year observations. *T*-values are calculated from heteroskedasticity-and-autocorrelation-consistent standard errors (Newey-West HAC standard errors). All model specifications include year and industry dummies, but these coefficients are not reported here.

First, we estimate a basic OLS model with a specification similar to other empirical debt maturity studies. The results are reported in column (1) of Table 2.4. Results in column (1) provide a mixed evidence for the adverse selection and signaling hypotheses. The nonmonotonic relationship between credit quality and debt maturity is supported by the positive, and negative respectively, coefficients on firm size, and its square (both significant at the 1% level) (H2). According to Diamond (1991a) the firms with the highest and lowest credit quality issue short-term debt, while the intermediate-quality borrowers rely on long-term debt. The positive relationship between the firm size and debt maturity is also consistent with the hypothesis that small firms shorten their debt maturity due to moral hazard problems (H9). Further, the statistically significant coefficient on a dummy for firms with credit ratings suggests that access to the public market enables them to obtain long-term debt as opposed to firms relying exclusively on bank or private-non-bank debt (H3).

Table 2.4: Pooled OLS and 2SLS regressions estimating the determinants of debt maturity structure

The table reports results of pooled OLS and 2SLS regressions of debt maturity on a set of potential determinants. The explained variable is debt maturity. Other explanatory variables are defined in Table 2.2. The model (1) is estimated using ordinary least squares. The model (2) uses two stage least squares, where leverage is endogenous variable. Instruments are all exogenous variables from model (1) and proxies for firm's collateral and profitability. Year and industry dummies have been included in both models, but not reported. The symbol '***' denotes that the estimated coefficient is significant at the 1% level; '**' at the 5% level; '*' at the 10% level. The *t*-values, included in parentheses, are based on Newey-West HAC standard errors.

	(1)		(2)	
Intercept	-1.783***	(-2.77)	-1.636**	(-1.98)
Firm size	0.361***	(4.35)	0.320***	(2.94)
Firm size squared	-0.013***	(-4.70)	-0.011***	(-3.16)
Market-to-Book ratio	-0.011**	(-2.05)	-0.001	(-0.13)
Asset maturity	0.004***	(2.97)	-0.001	(-0.02)
Effective tax rate	-0.094***	(-2.79)	-0.052	(-1.16)
Volatility	0.147	(0.61)	-0.140	(-0.45)
Rated	0.040***	(2.82)	-0.009	(-0.32)
Regulated	-0.056*	(-1.93)	-0.055	(-1.27)
Future abnormal earnings	-0.004	(-0.07)	-0.132	(-1.50)
Leverage	-		0.966**	(2.19)
Adjusted R-squared	0.229		0.095	
Number of observations	2081		2081	

The coefficient on future abnormal earnings is negative, but it is not significantly different from zero. In Barclay and Smith (1995), Stohs and Mauer (1996) and Ozkan (2000) future abnormal earnings are used to test Flannery's (1986) signaling hypothesis. All three studies provide evidence for a negative relation between future abnormal earnings and debt maturity. Our non-significant result cannot be considered as conflicting with Flannery (1986). A firm has no incentive to signal by shortening debt maturity unless it has both positive (inside) information and there is asymmetric information about its earnings (H1). We will return to this issue in more detail in Table 2.5.

Next, we focus on the variables controlling for potential moral hazard problems. The proxy for growth opportunities (*i.e.* market-to-book ratio) has a significantly negative impact on the debt maturity. This implies that firms with growth opportunities issue short-term debt to decrease agency costs of debt (H6). However, the negative sign on the regulated-firm dummy is opposite to the prediction of less severe moral hazard problems for firms with lower discretion over investment decisions (H10). Similar to all other

studies exploring the determinants of debt maturity, we find strong evidence that firms match the maturity of their assets with the liabilities (H7). Finally, the significantly negative coefficient on marginal tax rate suggests that the tax advantage of debt negatively effects debt maturity (H11). There is no evidence that firms would shorten or lengthen their debt maturity depending on the asset value volatility (H8).

The model that we have just discussed omitted a potentially crucial determinant of the debt maturity structure, *i.e.* leverage. The theories reviewed in section 2.2 suggest that decisions concerning the debt maturity might be much more of importance to firms with high levels of debt in their capital structure than to firms with low leverage. When we include leverage in the model, it is essential to keep in mind that leverage could be determined by other variables that determine debt maturity, such as firm size, market-to-book ratio, or volatility. We carry out the Hausman test to test for endogeneity of leverage in our model. The test rejects the null hypothesis that leverage is exogenous.[10] Because our model contains leverage as an endogenous explanatory variable, applying ordinary least squares to estimate the coefficients of this model would generate biased and inconsistent estimators. Instead we use the instrumental variable approach, where the list of predetermined variables (instruments) is based on the reduced-form solution of the structural model. In order to ensure identification of the model, we include two variables that according to the theoretical models and prior empirical evidence should be related to leverage, but not debt maturity.[11]

The model in column (2) of Table 2.4 is estimated by applying two-stage least squares with Newey-West heteroskedasticity-and-autocorrelation-consistent standard errors. The coefficient for leverage is positive and significantly different from zero at the 5% level. This result is consistent with Diamond (1991a) where firms with high leverage prefer long-term debt in order to avoid suboptimal liquidation (H4a). The positive effect of leverage on debt maturity is also documented in the empirical literature.[12] There is no evidence that firms with high leverage decrease their debt maturity in order to mitigate Myers' (1977) underinvestment problem (H4b). The significant coefficients for firm size and its square provide further support for the nonmonotonic relationship between the firm credit quality and its debt maturity, where the best and worst credit-quality firms obtain short-term debt and the intermediate borrowers issue long-term debt (H2).

The coefficients for other control variables are not significantly different from zero. The difference between the results for market-to-book variable, asset maturity, tax

[10] The results of the Hausman (1978) test are available from the author upon request.

[11] The two variables are proxies for collateral and profitability. Collateral is measured as total inventory and net plant, property and equipment over total assets. Profitability is a ratio of operating income over book value of total assets.

[12] Stohs and Mauer (1996), Antoniou *et al.* (2002), and Johnson (2003) report a positive significant coefficient of leverage in the debt maturity equation. Barclay and Smith (1995) find a positive correlation between leverage and debt maturity.

rate, rated and regulated dummy in the two columns of Table 2.4 confirms the importance of controlling for leverage in a debt maturity model. In an analysis, not reported here, we calculate the correlations between debt maturity, leverage and the five explanatory variables mentioned above. The correlation between debt maturity and leverage is significant and positive (value of 0.3). The proxy for effective tax rate is correlated neither with debt maturity nor leverage. The correlations between debt maturity and the remaining four explanatory variables are significantly different from zero. The coefficients are, however, in the absolute value smaller than those of correlations between leverage and the four explanatory variables.

So far, in this section, we have investigated the relation between debt maturity and variables that were hypothesized to determine it. The following section improves the tests of adverse selection models discussed in section 2.2.1. Table 2.5 examines the joint effect of asymmetric information and future abnormal earnings on debt maturity (H1). The model in column (3) of Table 2.5 addresses the question whether certain debt maturity is preferred by firms with both good inside news and high asymmetric information between firm insiders and lenders. From results in columns (1) and (2) we know that future abnormal earnings do not explain debt maturity structure. In testing the signaling hypothesis of Flannery (1986), it is necessary to realize that the degree of information asymmetry varies among firms. A firm with positive news, but subject to low information asymmetry might be indifferent between short-term and long-term debt. On the contrary, a firm with a high degree of information asymmetry (*e.g.* young or shortly-listed firm) and favorable information might rely more on short-term debt to decrease the costs of adverse selection. In column (3) we estimate a two-stage least-square regression with two additional interactive variables: *Future abnormal earnings × High short-term asymmetric information dummy* and *Future abnormal earnings ×(1–High short-term asymmetric information dummy)*. These interactive variables estimate whether positive information has different effect on debt maturity in case of firms with high short-term information asymmetry and the other firms (H1). A firm is defined as being a subject to high short-term asymmetric information if the value of short-term asymmetric information is above the 75th percentile. We can, indeed, see that firms with *both* favorable information *and* high short-term asymmetric information rely more on short-term debt, and thus signal their quality. This is not the case for firms with lower information asymmetry. The coefficient of the *Future abnormal earnings × (1–High short-term asymmetric information dummy)* variable is not significantly different from zero.

Table 2.5: The effect of information asymmetry on debt maturity

This table shows results for a debt maturity model with asymmetric information. The explained variable is debt maturity. High short-term asymmetric information dummy equals one when the firm's short-term asymmetric information is in the highest quartile of the distribution. Other explanatory variables are defined in Table 2.2. The model is estimated using two stage least squares. Year and industry dummies have been included, but not reported. The symbol '***' denotes that the estimated coefficient is significant at the 1% level; '**' at the 5% level; '*' at the 10% level. The *t*-values, included in parentheses, are based on Newey-West HAC standard errors.

	(3)	
Intercept	-1.622**	(-2.15)
Firm size	0.323***	(3.24)
Firm size squared	-0.011***	(-3.49)
Market-to-Book ratio	-0.003	(-0.39)
Asset maturity	0.001	(0.309)
Effective tax rate	-0.060	(-1.44)
Volatility	-0.139	(-0.52)
Rated	0.001	(0.03)
Regulated	-0.056	(-1.44)
Short-term asymmetric information	0.009	(1.26)
Future abnor. earnings × High short-term asym. info. dummy	-0.203**	(-2.02)
Future abnor. earnings × (1 – High short-term asym. info. dummy)	-0.019	(-0.17)
Leverage	0.769*	(1.69)
Number of observations	2081	

Note that the coefficient for short-term asymmetric information is not significantly different from zero. Thus, the combination of information asymmetry and private positive news generates the incentive to shorten the maturity structure.[13] The results for other exogenous variables and leverage remain the same as in the model (2) in Table 2.4.

According to the so far untested theoretical model of Goswami *et al.* (1995), firms that have the largest difference in their asymmetric information concerning their short-term and long-term earnings should rely on long-term debt (H5). Firms that have similar asymmetric information over both horizons prefer short-term debt. To test this hypothesis we included two interactive variables: *High short-term asymmetric information dummy* × *Low long-term asymmetric information dummy* and *Low short-term asymmetric information dummy* × *High long-term asymmetric information dummy*. The variable *High short-term asymmetric information dummy* × *Low long-term asymmetric information dummy* is, for example, equal to one for firms with both short-term asymmetric

[13] We do not investigate whether long-term information asymmetry creates similar motives for signaling, as it is difficult to find a defendable measure of private inside information over the long horizon.

information in the highest quartile and long-term asymmetric information in the lowest quartile, and zero otherwise. The results of the regression are reported in column (4) in Table 2.6.

Table 2.6: The effect of short-term and long-term asymmetric information on debt maturity

This table investigates the effects of the short and long-term asymmetric information on debt maturity. The explained variable is debt maturity. High short-term (long-term) asymmetric information dummy equals one when the firm's short-term (long-term) asymmetric information is in the highest quartile of the distribution. Other explanatory variables are defined in Table 2.2. The model is estimated using two stage least squares. Year and industry dummies have been included, but not reported. The symbol '***' denotes that the estimated coefficient is significant at the 1% level; '**' at the 5% level; '*' at the 10% level. The *t*-values, included in parentheses, are based on Newey-West HAC standard errors.

	(4)		(5)	
Intercept	-1.655**	(-2.23)	-1.704**	(-2.23)
Firm size	0.327***	(3.33)	0.331***	(3.27)
Firm size squared	-0.011***	(-3.60)	-0.012***	(-3.51)
Market-to-Book ratio	-0.003	(-0.44)	-0.003	(-0.40)
Asset maturity	0.001	(0.31)	0.001	(0.22)
Effective tax rate	-0.062	(-1.51)	-0.054	(-1.31)
Volatility	-0.118	(-0.45)	-0.146	(-0.53)
Rated	0.001	(0.04)	-0.001	(-0.04)
Regulated	-0.055	(-1.43)	-0.057	(-1.45)
Short-term asymmetric information	0.010	(1.55)	-	
Future abnor. earnings × High short-term asym. info. dummy	-0.202**	(-2.05)	-0.192*	(-1.76)
Future abnor. earnings × (1 – High short-term asym. info. dummy)	-0.019	(-0.17)	-0.021	(-0.19)
High short-term asym. info. × Low long-term asym. info. dummy	-0.053	(-1.22)	-	
Low short-term asym. info. × High long-term asym. info. dummy	0.012	(0.276)	-	
Absolute value (Long-term – short-term asymmetric information)	-		0.010	(1.22)
Leverage	0.756*	(1.68)	0.806*	(1.79)
Number of observations	2081		2081	

The results in Table 2.6 provide no evidence for the hypothesis of Goswami *et al.* (1995). Only one of the two coefficients of the interactive variables has the expected positive sign. None of them is, however, statistically significant at standard significance levels. The effects of other variables on debt maturity in the model remain unchanged. In the next model in column (5) of Table 2.6 we check the robustness of this result by replacing the two interactive variables by the absolute value of the difference between the long-term and short-term information asymmetry proxies. Also in this model we do not find any support

for Goswami *et al.* (1995). While the sign of the coefficient suggests that firms with large differences in information asymmetries between the two horizons have more long-term debt, the coefficient is not significantly different from zero. Our data do not provide robust evidence that firms with high differences in their term structure of asymmetric information prefer long-term debt.

2.5 Conclusions

In this chapter we investigate how a firm makes the choice between short-term and long-term debt in a situation when managers know more about the firm's prospects than the market. We demonstrate that in the empirical tests of adverse selection models it is important to keep in mind that the information asymmetry varies across firms. A firm with positive news about its value and low information asymmetry has no reason to signal its quality. However, according to Flannery's (1986) model, issuing a short-term debt is an optimal action for a firm with *both* positive private news *and* a high degree of asymmetric information about its future earnings. Our results strongly support this hypothesis.

Our measures of asymmetric information are derived from the dispersion of analyst earnings forecasts around the mean forecast. The idea behind these measures is that a lack of consensus among analysts following a particular firm reflects a lack of firm-specific information. Moreover, this methodology that we propose allows us to make distinction between asymmetric information regarding a firm's short-term earnings and long-term earnings. Therefore, this chapter presents the first test of the Goswami *et al.* (1995) model. We find no evidence for the empirical implications of their model that firms with a large difference between information asymmetry concerning their short and long-term earnings should rely more on long-term than on short-term debt.

Next, this study takes into account that decision concerning the debt maturity should be much more of importance to firms with high levels of debt in their capital structure than to firms with low leverage. In our model, leverage is an endogenous variable. The results provide robust evidence that leverage has a positive effect on debt maturity. This result is consistent with Diamond (1991a) where firms with high leverage optimally issue long-term debt in order to avoid suboptimal liquidation. There is no evidence that firms with high leverage decrease their debt maturity in order to mitigate Myers' (1977) underinvestment problem.

Finally, we test determinants of debt maturity structure selected by previous empirical studies to facilitate the comparison of results. The estimated coefficients on firm size and its square provide strong support for the nonmonotonic relationship between a firm's credit quality and its debt maturity, where the best and worst credit-quality firms obtain short-term debt and the intermediate borrowers issue long-term debt.

Chapter 3

Do Banks Influence the Capital Structure Choices of Firms?

3.1 Introduction

The involvement of banks in non-financial firms is a large and important area of scientific research. A large number of theoretical and empirical studies on firm-bank relationships investigate the effects of these relations on bank loans and firm performance (see Boot (2000) and Ongena and Smith (2000) for recent reviews). Studies on the firm-bank relations show that banks provide many different services to firms. Through this multitude of services banks obtain information about the firm, which is not available to outsiders. Banks develop relations with firms, based on repeated services and their information advantage. On the one hand, bank relations may be beneficial to the firms because the bank, as a delegated monitor, bridges information problems between borrowers and lenders. On the other hand, banks may (ab)use their information advantage and the channels of their relations, for example, to reduce leverage, because this increases the value of bank debt.

The most important firm-bank relation is borrowing and lending. Banks as a source of debt are studied in several empirical studies (see, *e.g.*, Houston and James (1996)). From the perspective of firms, decisions about bank debt are part of the capital structure choice, together with the choice of leverage and debt maturity. In a wide range of empirical papers leverage is explained from proxies for tax, bankruptcy and agency

theories (see, *e.g.*, Rajan and Zingales (1995)). Other studies investigate the determinants of debt maturity choice (see Barclay and Smith (1995)). Most recently, the notion that several capital structure decisions are interdependent has emerged in the literature. For example, Barclay *et al*. (2003) and Johnson (2003) study maturity and leverage and Johnson (1997) measures the relation between maturity and the source of debt.

Our study investigates the role of bank involvement in a capital structure setting. The question we address is whether bank involvement is related to capital structure choices. However, a firm's capital structure involves a complex set of decisions, which at least include the debt-equity choice and choices of the maturity and sources of debt. Therefore, in a first instance we simultaneously model these three capital structure decisions. This approach contributes to the empirical literature because the simultaneous model involves three decisions, while existing studies focus on a single decision or, at best, two decisions. The three-decision model is initially tested for the full sample of firms. Our main hypothesis, however, is that bank involvement is related to capital structure choices. Therefore, we expect that the outcomes of our three-decision model are different for sets of firms with varying degree of bank involvement. Next to debt financing, banks have additional channels to influence firms. One opportunity is through a bank's shareholdings in a firm and another is through interlocking directorates. In the second part of the paper we explore the effects of differing degrees of bank involvement and we divide our sample on the basis of non-debt bank influence. We measure bank influence as equity ownership and interlocking directorates and we distinguish four groups: no bank involvement, banks own equity, banks have interlocks, and banks have both equity and interlocks. For each of these groups we estimate our three-equation model and we compare the results across sub-samples. This analysis is a contribution to the literature on firm-bank relations as it describes how bank relations are linked to the firms' capital structure choices. So far, the banking literature has considered the terms of banks debt, without investigating other capital structure choices.

We test the relation between bank involvement and capital structure choices for a sample of Dutch firms. The Netherlands provides an excellent arena to study the impact of banks on firms, because Dutch banks have a strong position and many relations with non-financial firms.[14] The concentration of the five largest banks in the Netherlands was over 80% in the period between 1998 and 2000, which illustrates the power of these five banks (European Central Bank (2002)). Dutch banks also hold shares of their customers.

[14] A typical example is Getronics. The large Dutch banks ING and ABN Amro provided loans to this computer firm when financial troubles arose. Foreign banks were not eager to help the firm, but the many relations of the Dutch banks saved the firm. ING provided loans, owns large amount of preferred shares and some common shares, has a vice-chair of the supervisory board who is chair of the supervisory board in Getronics, and advises the firm. Most likely ING is a customer and ING's investment funds held convertibles. Not surprisingly, the initial restructuring proposal, advised by ING, was at the expense of the regular bondholders and shareholders (*Het Financieele Dagblad*, February 3, 2003).

However, due to the weak position of shareholders in Dutch firms, a sole shareholding of a bank in a firm might not be enough to exercise influence over its capital structure. The undeveloped public debt market strengthens the position of banks, because alternatives for bank debt are limited. Finally, we expect that banks ensure strong positions in firms through a representation on the board, *i.e.* interlocking directorates.[15] In several other countries a bank-based system prevails, in which large and powerful banks pay a prominent role in the financing of firms. For example, the European Central Bank (2002) reports that in Germany loans from *Hausbanken*, which have close relationships with firms, represent the most important external financing source.

We find that the outcomes of the three-equation capital structure model differ between sub-samples with different degrees of bank involvement. Thus, bank involvement co-determines capital structure choices. These results emphasize the importance of firm-bank relationships in capital structure choices. We find strong indications that bank influence in the Netherlands goes beyond providing debt. For example, firms with bank interlocks exhibit a negative effect of bank debt on leverage, while this relation is absent in firms without this bank involvement. The result suggests that banks maximize the value of their loans by reducing overall leverage, which is consistent with the preference of banks for low risk customers (Carey *et al*. (1998)). Further, we find that the absence of bank relations increases the positive effect of leverage on maturity, which is consistent with Diamond's (1991a) liquidity risk theory. The results indicate that banks mitigate liquidity risk. The findings in this study illuminate the importance of our set-up because banks appear to influence capital structure choices through other channels than bank debt. Finally, we find a strong trade-off between bank debt and maturity, which is independent of the degree of bank involvement.

The remainder of this chapter is organized as follows. In section 3.2 we describe the theoretical model and we define our hypotheses. Section 3.3 contains the description of the sample and the definitions. The full-sample results for the model are in section 3.4, while in section 3.5 we investigate the role of bank involvement. Section 3.6 concludes.

3.2 Model, theory and hypotheses

This paper investigates the role of banks in capital structure decisions of firms. Consequently, we first need to construct a model for a firm's capital structure choice,

[15] Two observations illustrate the relevance of bank interlocks. The president of the Dutch central bank recently mentioned: "We do not argue that a manager of a large firm should never be on the board of its house bank. But in case there is a situation where the relation between a bank and a firm develops such that conflicting interests arise, yes we pay attention and we have intervened in the past (…) I can assure you: we intervened more than once." (*NRC Handelsblad*, June 12, 2003). The second observation is that in Chapter 4 we report that the presence of bankers on the board is critical for removing an underperforming chairman from the managerial board in the Netherlands.

before we can incorporate the role of banks. However, capital structure choice is a complex issue involving multiple decisions. In order to have a sufficiently broad perspective on capital structure, we model leverage, debt maturity and the source of debt. In this section we first define a general empirical model for these three capital structure choices and their determinants (3.2.1). We state explicit hypotheses based on a set of theories: tax effects and bankruptcy costs (3.2.2), moral hazard (3.2.3), adverse selection (3.2.4) and specialization in the lending market (3.2.5). This is a necessary foundation for our later refinements on the role of banks in capital structure choice. The section ends with a review of empirical studies about relations among capital structure decisions (3.2.6).

3.2.1 A general model for three capital structure choices

Theoretical models propose a wide variety of determinants of leverage (*LEV*), debt maturity (*DEBMAT*) and source of debt (*BANKD*). Moreover, theory also suggests that the three choices might be determined jointly. The transformation of theory into an empirical model requires three, partly overlapping, sets of exogenous variables affecting the three endogenous variables. We denote the vector containing these variables by x_1, x_2, and x_3, respectively. We consider the following structural form of the simultaneous equations model:

$$\begin{aligned} LEV_{it} &= x_{1,it}^{/}\beta_1 + \gamma_{12} DEBMAT_{it} + \gamma_{13} BANKD_{it} + \varepsilon_{1,it} \\ DEBMAT_{it} &= x_{2,it}^{/}\beta_2 + \gamma_{21} LEV_{it} + \gamma_{23} BANKD_{it} + \varepsilon_{2,it} \\ BANKD_{it} &= x_{3,it}^{/}\beta_3 + \gamma_{31} LEV_{it} + \gamma_{32} DEBMAT_{it} + \varepsilon_{3,it}, \end{aligned} \tag{1}$$

where *i* indexes firms, and *t* indexes years. As we model three capital structure choices, our model contains a large set of explanatory variables. Identification of the three individual equations requires that the sets of variables included in each equation are "sufficiently different." That is, exclusion restrictions should hold for each equation such that sufficient instruments can be obtained within the system to estimate the parameters of interest. Therefore, in the remainder of this section we review theoretical models concerning leverage, debt maturity and bank debt decisions, and discuss the corresponding explanatory variables. We focus on the most relevant theories modeling the relations between the above-mentioned capital structure choices. An overview of theories, determinants and the hypothesized effects is provided in Table 3.1.

Table 3.1: Theories and determinants

This table summarizes theories, determinants and hypotheses related to leverage, debt maturity, and bank debt.

Theories	Determinants	Hypotheses
	Panel A: Leverage	
Tax effects	Marginal tax rate	L1 (+)
	Non-debt tax shields	L2 (-)
Bankruptcy costs	Collateral value of assets	L3 (+)
	Probability of bankruptcy	L4 (-)
Moral hazard	Free cash flow	L5 (+)
	Growth opportunities	L6 (-)
	Debt maturity	L7a (-)
	Bank debt	L8a (+)
Adverse selection	Debt maturity	L7b (+)
Specialization in corporate lending market	Bank debt	L8b (-)
	Panel B: Debt maturity	
Tax effects	Term structure of interest rates	M1 (+)
	Marginal tax rate	M2a (-), M2b (0)
Asset risk	Asset value volatility	M3a (-), M3b (+)
Moral hazard	Growth opportunities	M4 (-)
	Asset maturity	M5 (+)
	Leverage	M6a (-)
	Bank debt	M7a (-)
Adverse selection	Insider information about firm quality	M8 (-)
	Risk of liquidation	M9 (non-linear)
	Leverage	M6b (+)
	Bank debt	M7b (-)
	Panel C: Bank debt	
Moral hazard	Growth opportunities	B1a (+)
	Leverage	B2a (+)
	Debt maturity	B3 (-)
Adverse selection	Information asymmetry	B4 (+)
	Debt maturity	B3 (-)
Hold-up problem	Growth opportunities	B1b (-)
	Firm's bargaining power	B5 (+)
Specialization in corporate lending market	Credit quality	B6 (-)
	Probability of financial distress	B7 (+)
	Liquidation value	B8 (+)
	Interim indicator informativeness	B9 (-)
	Leverage	B2b (-)
Flotation costs	Firm size	B10 (-)

3.2.2 Tax effects and bankruptcy costs

The optimal leverage of a firm is determined by a trade-off between benefits and costs of debt. The tax advantage of debt depends on the tax deductibility of interest payments and is positively related to the firm's marginal tax rate (Modigliani and Miller (1963)) (see hypothesis L1 in Table 3.1). DeAngelo and Masulis (1980) show that this advantage of

debt can be crowded out by alternative non-debt tax shields, such as depreciation or investment tax credits (L2). The optimal debt ratio is also negatively related to the expected bankruptcy costs, which decrease with a firm's collateral value of assets (L3) and increase with the probability of bankruptcy (L4).

The next set of models reveals the complexity of relationships between leverage, debt maturity and some determinants of optimal leverage. Brick and Ravid (1985) keep leverage constant and model the effects of the term structure of interest rates on optimal debt maturity in the presence of taxes. When the term structure of interest rates is upward sloping, it is optimal to choose long-term debt because the present value of the tax shelter will be highest (M1 and M2a).[16] Lewis (1990) on the other hand determines leverage and debt maturity simultaneously and derives that taxes are irrelevant for the debt maturity decision (M2b). Kane *et al.* (1985) extend the tax-bankruptcy trade off by considering the costs of issuing debt. In this framework the tax advantage of debt is positively related to leverage (L1), but negatively affects debt maturity (M2a), because the decrease in the tax advantage of debt requires longer debt maturity in order to amortize floatation costs. Further, debt maturity will optimally decrease with increasing asset value volatility due to a higher probability of bankruptcy and the need to rebalance the capital structure more frequently (M3a). Wiggins (1990) finds a positive effect of asset risk on debt maturity in a model without transaction costs, treating tax shelters in case of default in a different way than Kane *et al.* (1985) (M3b).

Based on these theories we expect for leverage a positive relation with the marginal tax rate and the collateral value of assets and a negative relation with non-debt tax shields and the probability of bankruptcy. Debt maturity should be positively related to the term structure of interest rates, while the effects of the marginal tax rate and asset risk remain ambiguous. These theories do not provide clear predictions concerning the relationship between debt maturity and leverage.

3.2.3 Moral hazard

Moral hazard problems between stakeholders lead to agency costs of debt and equity. The choice of the level and type of debt can influence agency problems. Overinvestment is the problem that managers of firms with low growth opportunities tend to allocate free cash flows to projects with negative net present value (Jensen (1986)). In this situation debt plays a positive role by forcing managers to pay out free cash flows on fixed debt obligations. Debt reduces free cash flow directly and an additional effect is the disciplining through the threat of bankruptcy in case of bad investments (L5).

High leverage can lead to the rejection of positive net present value projects for firms with ample growth opportunities (Myers (1977)). Shortening debt maturity (the debt

[16] Later, interest rate uncertainty is introduced, resulting in long-term debt being optimal also for flat or even decreasing term structures (Brick and Ravid (1991)).

matures before the investment option is exercised) is a way to reduce this underinvestment problem. Myers also derives a motive for matching the maturities of a firm's assets and liabilities: the value of short-term debt is less sensitive to shifts in the variation of the project's cash flows than long-term debt. Barnea *et al.* (1980) argue that this property of short-term debt eliminates the incentives of shareholders to increase their payoffs by increasing the project risk – the asset substitution problem. Therefore, we expect a negative relationship between a firm's growth opportunities with both leverage (L6) and debt maturity (M4). Another empirical implication is a negative relationship between leverage and debt maturity (L7a and M6a). Finally, the maturity of assets is expected to positively affect debt maturity (M5).

Adjustments in the debt ratios and maturities are not the only remedies for moral hazard problems. There is a vast literature exploring the role of banks in contracting, monitoring and providing proper incentive structures to borrowers that are expected to be susceptible to underinvestment and asset substitution problems. Myers (1977) describes the benefits of monitoring by the lender and the possibility to renegotiate the contract for the reduction of sub-optimal investment decisions (L8a). Delegated monitoring by a financial intermediary has lower monitoring costs as opposed to a group of individual borrowers and avoids the free rider problem (Diamond (1984)). However, according to Rajan and Winton (1995) banks have a natural preference for providing short-term loans as their liabilities contain a significant proportion of short-term liquid deposits (B3 and M7a). Smith and Warner (1979) describe the role of private debt with covenants in decreasing the agency costs of debt. Finally, according to Diamond (1991b) bank monitoring has two purposes: screening serves to eliminate borrowers with risky projects and to provide incentives to engage in safe projects. Therefore we expect that firms with high growth opportunities and high leverage, which are more likely to face shareholder-bondholder conflicts, have a higher proportion of bank debt in their capital structure (B1a and B2a). Accordingly, we expect bank debt to have shorter maturities.

While the benefits of debt provided by banks are well documented, the disadvantages of close bank relationships are less clear. Rajan (1992) suggests that the benefits of bank monitoring can be lost when the bank creates information monopolies. Borrowers with large information asymmetries might find themselves unable to switch the lender and can face excessive rent extraction and incentive distortion, unless they possess a strong bargaining position vis-à-vis the bank. Gaining access to the public debt market can also eliminate the bank's information monopoly. The empirical implication is that borrowers with high growth opportunities and a weak bargaining position (*e.g.* due to bank shareholdings or no access to public debt market) will rely less on bank debt (B1b and B5).

3.2.4 Adverse selection

The central theme of adverse selection models is the presence of information asymmetry between parties prior to contracting, which is costly because the actual price differs from the price under equal information. In capital structure theory, asymmetric information is reflected in the superior information that a firm's management has as opposed to their lenders. Flannery (1986) and Kale and Noe (1990) describe how firms with favorable private information can signal this news by issuing short-term debt (M8). However, according to Diamond (1991a) issuing short-term debt increases the liquidity risk, *i.e.* the risk of sub-optimal liquidation when lenders refuse to refinance illiquid, though solvent borrowers.[17] Johnson (2003) argues that increasing liquidity risk by issuing short-term debt can be compared to increasing expected bankruptcy costs, which have a negative effect on optimal leverage (L7b and M6b). This effect is likely to be stronger for firms that have limited possibility to issue long-term debt such as firms without access to public debt market or firms without close bank relationships. Diamond (1991a) further predicts that the trade off between benefits and costs of short-term debt will result in a nonlinear relationship between the firm's debt maturity and its credit quality. The firms with the best and worst rating issue short-term debt, while other debtors borrow long-term funds (M9).

Several studies argue that private lenders have an information advantage about borrowers in comparison with public bondholders.[18] Firms with large information asymmetries are thus expected to obtain loans from banks in order to decrease adverse selection costs of debt (B4). Fama (1985) suggests that the closeness of the relationship between the bank and its customer and the additional information that the bank is able to collect about the firm from its current/deposit accounts is especially valuable in providing short-term loans (M7b and B3).

3.2.5 Specialization in corporate lending market

Several models derive that firms with low credit quality or a higher probability of financial distress seek to obtain debt monitoring by banks (B6 and B7) (see Berlin and Loeys (1988), Berlin and Mester (1992), and Chemmanur and Fulghieri (1994)). Public debt is less beneficial for this type of borrowers as it does not allow easy renegotiation, and liquidation decisions are not likely to be efficient. Furthermore, in Berlin and Loeys (1988), firms face a choice between unmonitored loans with covenants (public debt) and monitored loans (bank debt). They argue that firms with high proportions of intangible or firm-specific assets cannot benefit from close monitoring, because even early liquidation will raise only low liquidation values (B8). In addition, firms whose interim financial

[17] The excessive incentive of lenders to liquidate borrowers is caused by their inability to recognize and accrue all the future control rents that are assigned to borrowers in a state without liquidation.

[18] See, *e.g.* Leland and Pyle (1977), Ramakrishnan and Thakor (1984), Fama (1985) and Boyd and Prescott (1986).

indicators provide noisy signals about their credit health attach a high value to the option to renegotiate the debt provided by banks (B9). Chemmanur and Fulghieri (1994) emphasize the ambition of banks to develop a reputation for being financially flexible, *i.e.* making the correct renegotiation versus liquidation choice. This desire gives banks an incentive to commit more funds to the evaluation of borrowers in financial distress. Firms with higher probabilities of distress thus have a preference for bank debt over public debt, in contrast to less risky firms that do not wish to be pooled with such borrowers.

However, in the empirical study of Carey *et al.* (1998) the banks' reputation (or regulation) effect leads to a specialization in providing funds to low-risk customers. They find that both banks and other private lenders supply loans to firms with unobservable ex-ante risk. The distinction between the two types of lenders arises when the observable risks of borrowers (such as leverage) are considered. Banks have two reasons for their preference to lend to firms with low leverage (B2b). First, regulation of banks relates capital requirements to the risk of their assets and thus motivates banks to provide loans to relatively safe borrowers. Second, banks wish to develop a reputation for being reasonable when the terms of the contract must be renegotiated. Being known for not using these situations to extract maximum rents is a valuable asset for banks, which can be lost in case frequent liquidations of borrowers are observed. Therefore, we expect a positive effect of a firm's liquidation value and the probability of financial distress on the proportion of bank debt in the capital structure. However, the relationship between the observable risks, credit quality and the precision of interim indications and the bank debt preference is likely to be negative.

Finally, Blackwell and Kidwell (1988) compare transaction costs of public and private debt issues, which include flotation, agency and searching costs, and conclude that a firm selects the debt market that minimises these costs. Flotation costs of public debt issues have a large fixed part that makes private debt preferable for small firms or firms with small average debt issue volume (B10).

3.2.6 Prior empirical evidence

While this study simultaneously analyses three capital structure decisions and their interactions, empirical models in the current literature incorporate up to two decisions. A substantial number of papers investigate the relationship between leverage and debt maturity, while a small number of studies examine maturity and the source of debt. Finally, several papers consider leverage and the source of debt simultaneously.

There are several empirical studies exploring the link between debt maturity and leverage. Barclay and Smith (1995) find a positive correlation between leverage and debt maturity. Stohs and Mauer (1996) explain the positive coefficient for leverage in their debt maturity equation by Diamond's (1991a) liquidity risk effects of short-term debt. A similar conclusion is drawn in Antoniou *et al.* (2002) for the UK, Germany and France. In recent

papers, such as Barclay *et al.* (2003) and Johnson (2003), simultaneous equations for leverage and maturity are modeled. Barclay *et al.* (2003) find a negative effect of leverage on debt maturity and a positive effect of debt maturity on leverage. While the first result is attributed to the substitution of leverage and debt maturity in mitigating moral hazard problems, the latter is mentioned to be puzzling. The main question of Johnson (2003) is whether short-term debt alleviates the negative effect of growth opportunities on leverage. Johnson reports a mutually positive relationship between leverage and debt maturity, which is again explained by the liquidity risk impact of short-term debt on leverage.

Two studies have analyzed the relation between maturity and the source of debt. Johnson (1997) reports that the estimated coefficients of the determinants of the ratio of long-term bank debt to total long-term debt remain unchanged when the same determinants are used to explain residuals from regression of long-term bank debt on total long-term debt. Denis and Mihov (2003) estimate a two-stage model where first the maturity of new debt issues is predicted. The predicted value is then used as an explanatory variable in a logit analysis of debt source. Although the first-stage regression has substantial explanatory power, predicted maturity in the second stage does not appear to affect the source of debt. Thus, the scarce empirical evidence favors the independence of the two capital structure decisions.

The empirical literature on the relationship between the source of debt and leverage mainly focuses on the determinants of the lender identity (bank, private non-bank or public) in case of new loans. The only exception is Johnson (1997), who analyzes the effects of firm characteristics on the corporate debt ownership structure. He finds that leverage is positively related to the proportion of bank debt in firms' debt structure and argued that this is consistent with the demand of highly leveraged firms for close monitoring by banks. The results for the effects of leverage on the marginal lender choice are limited and inconclusive. Carey *et al.* (1998) show that banks specialize in loans for firms with low observable risk, as proxied by leverage. The evidence of Denis and Mihov (2003) on the other hand does not find any impact of leverage on the choice between bank and private non-bank debt. The probability of issuing public debt is however positively related to leverage. Finally, in Hadlock and James (2002) the likelihood of a bank loan announcement is positively related to leverage.

3.3 Sample and definitions

Our sample consists of all non-financial firms listed for at least one full calendar year on the Amsterdam Exchanges during the ten-year period between 1992 and 2001. We eliminate firm-years with missing observations for any of the variables defined in this section. The final sample thus includes 205 firms and 1205 firm-year observations.

This analysis combines three data sources. First, balance sheet, profit and loss account, and some stock market related data are obtained from the Reach database. Second, the *Gids bij de Officiële Prijscourant van de Amsterdamse Effectenbeurs* − an annual overview of securities listed at the Amsterdam Exchanges − reports publicly-listed debt instruments. Third, ownership structure data is obtained from the leading Dutch financial newspaper, *Het Financieele Dagblad.* Their list of owners of exchange-listed firms is formed according to the compulsory notifications for *Wet Melding Zeggenschap* (the Law on disclosure of shareholdings).

The main aim of this study is an empirical analysis of the simultaneous relationships among three capital structure decisions. A firm's capital structure is described by its *leverage*, which we define as total debt over the book value of total assets. Firms can obtain debt in a variety of forms, maturities, priority structures, from different sources and with various covenants. Although these are all important characteristics of debt that our investigation should ideally address, we limit ourselves to two of them, mainly due to data availability. First, *debt maturity*, which we measure as the ratio of long-term debt to total debt. Long-term debt is debt that matures in a period longer than one year.[19] Second, we are interested in the *source of debt*. The empirical literature makes a broad distinction between three debt providers – investors in public debt issues, banks and other non-depository financial institutions.[20] We define bank debt as the ratio of both short and long-term bank debt to total debt. While the Reach database enables us to precisely identify the amount of bank debt, it is impossible to make an accurate distinction between the other two debt providers.[21]

In addition to the capital structure measures, our model includes several explanatory variables. We proxy the *marginal tax rate* by the ratio of taxes paid to pretax income. Titman and Wessels (1988) define *non-debt tax shields* as operating income less interest and taxes paid over the corporate tax rate, relative to the book value of total assets. We use fixed tangible assets and inventory scaled by total assets as a proxy for *collateral value of assets*. It is likely that this measure is also related to the firm's *liquidation value*. The standard deviation of the return on assets, measured over the preceding five-year period, approximates the *asset value volatility*. Further the volatility of asset returns is

[19] The one-year cut-off between short and long-term debt reflects the accounting definition used in balance sheets, which are our source of data. Alternatively, Stohs and Mauer (1996) construct a weighted average maturity of all firm's liabilities. Even after consulting firms' annual reports we were not able to obtain data for a similar measure of debt maturity.

[20] See, *e.g.* Carey *et al.* (1998), Johnson (1997), Denis and Mihov (2003).

[21] *Gids bij de Officiële Prijscourant* annually publishes a list of firms with outstanding public debt and its characteristics. There are two reasons why we prefer to refrain from using the amounts of debt listed in this overview as a measure of outstanding public debt for our purposes. Firstly and most importantly, the date of collection of information by the *Gids* does not match the balance sheet dates. Secondly, accounting procedures for bookkeeping of debt may cause that the amount on the balance sheet does not equal the outstanding amount published by the *Gids*. The limited disclosure of debt providers other than banks in annual reports does not help to solve this issue either.

often used as a proxy for the *probability of bankruptcy*. Next to it, we expect this volatility to be negatively related to the *informativeness of the interim financial ratios,* as for firms with volatile returns these indicators are likely to provide noisy signals about their credit health. We include Tobin's Q as a proxy for a firm's *growth opportunities*. Tobin's Q is the market value of the firm divided by the replacement value of the assets.[22] *Free cash flows* are defined as a ratio of operating income, minus taxes, interest expenditures, and dividends, over total assets (Lehn and Poulsen (1989)).

To measure the *term premium* for a given year, we follow Barclay and Smith (1995) by using the difference between the monthly yield on 10-year government bonds and the monthly interbank 6-month rate (there are no short-term government bonds in the Netherlands). To test the hypothesis that firms match *the maturity of assets* and liabilities, we estimate asset maturity similar to Stohs and Mauer (1996) as the book value weighted average of the maturities of current assets and net property, plant and equipment. The maturity of current assets is calculated as the ratio of current assets to cost of goods sold. In estimating the maturity of net property, plant and equipment we assume straight-line depreciation and calculate a ratio of net property, plant and equipment to annual depreciation expense. We use future abnormal earnings, defined as earnings per share in year *t+1* less earnings per share in year *t* divided by the end of year *t* share price, as a proxy for the *insiders' private knowledge,* similar to, *e.g.,* Barclay and Smith (1995) and Stohs and Mauer (1996)). Diamond (1991a) predicts a non-linear relationship between the firm's credit rating and debt maturity. Given the lack of credit ratings for a large number of firms in our sample we follow Johnson (2003) and proxy *liquidity risk* by a measure of firm size (book value of total assets) and its square.

Borrowers with *information problems* are likely to be small firms, as defined by the asset size, and firms with growth opportunities (Carey *et al.* (1998), Johnson (1997)). The extent of the hold-up problem (Rajan (1992)) that the informational problematic borrowers face should also depend on their *bargaining power* vis-à-vis the bank. The extent of a firm's reliance on a single bank is hypothesized to depend on whether the firm has multiple bank relationships or access to the public debt market. The lack of access to the public debt market is measured by a dummy variable, which equals one for firms without outstanding public debt and zero otherwise. Furthermore, we have information on two potential proxies that are likely to be negatively related to the firm's bargaining position. First is the equity stakes of banks in the firm and second, a dummy variable that equals one if there is a banker on the firm's supervisory (*i.e.* non-executive) board. Finally, we use *profitability*, defined as the ratio of operating income to total assets, as a measure of credit quality that we expect to be negatively related to the demand for bank debt.

[22] We estimate the replacement value as described in Perfect and Wiles (1994). See De Jong (2002, p. 39) for a discussion of estimating the replacement value of assets of Dutch firms.

In Table 3.2 we present summary statistics for our sample of Dutch listed firms in the period between 1992 and 2001.

Table 3.2: Summary statistics

This table presents summary statistics for the full sample of firms. The total number of observations is 1205 firm-years for 205 firms over 1992-2001. The sources of data are annual reports, REACH, Het Financieele Dagblad, and Gids bij de Officiële Prijscourant van de Amsterdamse Effectenbeurs. Leverage is ratio of total debt (excluding current liabilities) to the book value of total assets. Debt maturity is defined as long-term debt over total debt. Bank debt is included as long-term and short-term bank debt over the book value of total assets. Firm size is the log of the book value of total assets in thousands of Euros. Collateral is ratio of fixed tangible assets and inventory to total assets. Taxation is taxes paid over pre-tax income. Non-debt tax shields are defined as operating income, less interest payments and tax payments relative to total assets. Volatility in year *t* is standard deviation of ratio of operating income to total assets over the period *t-1* to *t-5*. Tobin's Q is market value over replacement value of total assets. Free cash flow is operating income, minus taxes, interest expenditures, and dividends over total assets. Term premium is the difference between the Dutch IR swap 10-year rate and the Dutch interbank 6-month rate. Asset maturity is measured as the book value weighted average of the maturities of current assets and net property, plant and equipment, where the maturity of current assets is current assets over cost of goods sold and the maturity of fixed tangible assets is measured over annual depreciation expense. Abnormal future earnings in year *t* are defined as the earnings per share in year *t+1* less the earnings per share in year *t* divided by the end of year *t* share price. Profitability is ratio of operating income to book value of total assets. Convertible debt dummy equals one if the firm had in year *t* outstanding convertible debt according to Gids bij de Officiële Prijscourant van de Amsterdamse Effectenbeurs, and zero otherwise. Public debt dummy equals one if the firm had in year *t* outstanding public debt (other than convertible) according to Gids bij de Officiële Prijscourant van de Amsterdamse Effectenbeurs, and zero otherwise. Bank equity includes stakes above 5%. The number of bankers on the board is the number of interlocking directorates between firms in our sample and Dutch banks. Banker on the board dummy equals to one, if there is at least one banker on the board and zero otherwise.

	Mean	Median	Standard deviation
Leverage	0.258	0.242	0.162
Debt maturity	0.572	0.611	0.295
Bank debt	0.586	0.673	0.347
Firm size	12.355	12.292	1.937
Collateral	0.537	0.573	0.218
Taxation	0.285	0.305	0.275
Non-debt tax shields	0.034	0.045	0.117
Volatility	0.036	0.022	0.048
Tobin's Q	1.521	1.213	1.024
Free cash flow	0.014	0.025	0.113
Term premium	1.440	1.805	1.134
Asset maturity	7.284	2.560	74.241
Abnormal future earnings	0.011	0.011	0.281
Profitability	0.077	0.087	0.124
Convertible debt dummy	0.160	0.000	0.360
Public debt dummy	0.120	0.000	0.320
Bank equity	7.394	5.040	10.271
Banker on the board dummy	0.410	0.000	0.490
Number of bankers on the board	0.750	0.000	1.130

The capital structure of the firms shows that on average the assets are financed with 25.8% of debt. The average firm has 57.2% of its total debt maturing in more than one year and 58.6% of the debt is provided by banks. Almost a quarter (24.1%) of the firms has outstanding public debt. Less than half of the firms (41%) have at least one banker on the supervisory board and there is on average less than one banker on the board. The bank shareholdings are on average 7.4%.

3.4 Results: the capital structure choices model

This section presents the results of our three-equation model explaining leverage, debt maturity and bank debt. We test the hypotheses from Table 3.1 with model (1). Because our model contains endogenous explanatory variables, applying ordinary least squares to estimate the coefficients of this model would generate biased and inconsistent estimators. Therefore, we use the instrumental variable approach, where the list of predetermined variables (instruments) is based on the reduced-form solution of the structural model. The model is estimated by applying two-stage least squares with Newey-West heteroskedasticity-and-autocorrelation-consistent standard errors. Table 3.3 presents the results of the simultaneous equations model with the three endogenous variables, *i.e.* leverage, debt maturity, and bank debt. Figure 3.1 provides an overview of the estimated relationships among leverage, debt maturity and bank debt.

First we focus on the discussion of the results concerning the relationships among the three capital structure characteristics. In the leverage equation, debt maturity and bank debt have significantly negative coefficients of -0.544, and -0.408 respectively, at the 5% significance level. The coefficients of leverage and bank debt in the debt maturity equations are both significant at the 1% level. While leverage has a positive effect on the debt maturity, bank debt is negatively related to the debt maturity. Finally, in the bank debt equation we find that the coefficient of leverage is not significantly different from zero and debt maturity has a significantly negative impact (-0.736) on bank debt.

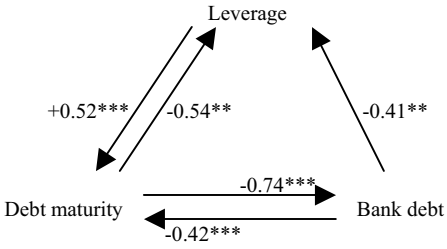
Table 3.3: Simultaneity in capital structure – leverage, maturity and bank debt

This table reports results for the simultaneous equations model, where the endogenous variables are leverage, debt maturity, and bank debt. The model is estimated using two stage least squares with Newey-West HAC standard errors and covariances. A constant, year dummies and fourteen industry dummies are included, though not reported. No public debt market access is dummy that equals one if the firm does not have any public debt outstanding, zero otherwise. High TQ is dummy that equals one if in the given year TQ is larger than the sample median. Other variables are defined in Table 3.1. The total number of observations is 1205. *t*-statistics are in parentheses. The symbol '***' denotes that the estimated coefficient is significant at the 1% level; '**' at the 5% level; '*' at the 10% level.

	Leverage	Debt maturity	Bank debt
Leverage	-	0.521*** (3.936)	0.071 (0.379)
Debt maturity	-0.544** (-1.985)	-	-0.736*** (-3.796)
Bank debt	-0.408** (-2.457)	-0.418*** (-5.918)	-
Firm size	0.009 (1.131)	0.049 (0.683)	-0.009 (-0.965)
Tobin's Q	0.007 (0.586)	0.005 (0.364)	0.005 (0.747)
Asset volatility	0.001 (0.004)	-0.044 (-0.188)	-0.200 (-0.704)
Collateral	0.469*** (4.008)	-	0.323*** (2.866)
Taxation	-0.046** (-1.972)	-0.010 (-0.337)	-
Non-debt tax shields	-1.966*** (-2.669)	-	-
Free cash flows	1.774** (2.359)	-	-
Term premium	-	-0.005 (-0.869)	-
Asset maturity	-	0.0003*** (4.101)	-
Abnormal future earnings	-	0.002 (0.967)	-
Firm size squared	-	-0.002 (-0.633)	-
Profitability	-	-	-0.075 (-0.852)
No public debt market access	-	-	0.202*** (3.975)
(High TQ) × no public debt	-	-	-0.025 (-0.652)
Banker on the board dummy	-	-	-0.086** (-2.167)
(High TQ) × banker dummy	-	-	0.066 (1.569)
Bank shareholding	-	-	0.002 (1.581)
(High TQ) × bank shareholding	-	-	-0.0002 (-0.159)

Figure 3.1: The estimated relationships between leverage, debt maturity and bank debt

This figure shows the estimated relationships between leverage, debt maturity and bank debt from Table 3.3. The symbol '***' denotes that the estimated coefficient is significant at the 1% level; '**' at the 5% level; '*' at the 10% level.



These results suggest that leverage has a positive impact on the debt maturity, while debt maturity negatively affects leverage. The former finding is consistent with Diamond (1991a) where firms with high leverage optimally issue long-term debt in order to avoid sub-optimal liquidations (M6b). The positive effect of leverage on debt maturity is also documented in the empirical literature.[23] The significantly negative coefficient of debt maturity in the leverage equation implies that decreasing the debt maturity increases optimal leverage, which is consistent with Myers' (1977) mitigation of underinvestment problems by shortening debt maturity (L7a).[24]

The negative relationship between debt maturity and the ratio of bank debt is consistent with the specialization of banks in providing short-term loans (M7a,b and B3).[25] Firms demanding short-term debt are likely to be satisfied by banks that have the informational advantage necessary for providing this type of debt in comparison to other alternative sources of debt (Fama (1985)). Also according to Rajan and Winton (1995), banks have a natural preference for providing short-term loans in order to match the

[23] Stohs and Mauer (1996), Antoniou *et al.* (2002), and Johnson (2003) report a positive significant coefficient of leverage in the debt maturity equation. Barclay and Smith (1995) find a positive correlation between leverage and debt maturity.

[24] While the hypotheses L7a and M6b are confirmed, it implies a rejection of Diamond's (1991a) liquidity risk story in the leverage equation (L7b) and Myers' (1977) underinvestment problem mitigation in the debt maturity equation (M6a). The inability to fully support one of the two theories and the two competing signs in the relationship between leverage and debt maturity might be also contributed to a misspecification of our model. See a similar problem in Barclay *et al.* (2003). We explore this possibility and provide some reconciliation in the next section.

[25] This result might be partially driven by an institutional feature, as Dutch firms do not issue public debt with maturities under one year. However, public debt use is relatively small.

maturity of their assets with liabilities, which contain a significant proportion of deposits on demand.[26]

Finally, the significantly negative effect of bank debt on leverage confirms the prediction of Carey *et al.* (1998) that banks prefer to provide loans to low risk borrowers either for reputational or regulatory reasons (L8b).[27] The negative impact of bank debt on leverage and insignificant effect of leverage on bank debt are not consistent with the hypothesized role of banks in the mitigation of moral hazard problems (L8a and B2a). The summary statistics in Table 3.1 revealed that banks, besides being important debt providers to listed Dutch firms, also hold positions on the supervisory boards and own equity stakes in the firms. These additional channels of influence might provide banks with easier ways to control debt policies of their borrowers. In the next section we set out to explore this idea in more depth.

The results for the control variables in the leverage equation in Table 3.3 provide mixed evidence for the tax and bankruptcy hypotheses. The coefficient of collateral is significantly positive suggesting that firms with lower bankruptcy costs have higher leverage (L3). We also find evidence for the crowding-out of tax advantages of debt by non-debt tax shields (L2). The non-debt tax shields proxy has a significantly (at the 1% level) negative impact on leverage. However, the negative sign on the taxation measure is opposite to the prediction (L1). Furthermore, asset volatility, approximating the probability of bankruptcy, does not appear to influence leverage (L4). Next, we focus on the variables controlling for potential moral hazard problems. We find no evidence that a firm's growth opportunities have impact on its leverage as the coefficient of Tobin's Q is not significantly different from zero (L6). On the other hand, free cash flows have a significantly positive coefficient. This is consistent with Jensen's (1986) overinvestment problem, where in the presence of free cash flow debt plays a disciplinary role (L5). Firm size does not appear to have a significant impact on leverage.

Similar to all studies exploring the determinants of debt maturity, we find strong evidence that firms match the maturity of their assets with the liabilities (M5).[28] The coefficient on the proxy for the asset maturity is positive and significant at the 1% level. Our results provide only limited support for the taxation and bankruptcy hypotheses. The insignificant coefficient on taxation suggests that taxes do not affect optimal debt maturity

[26] An interview in the Dutch financial press supports this conclusion. The chief syndicated loans at ABN Amro, mentioned so-called bridge loans that are provided by banks. For banks large long-term loans are unattractive due to the low interest rates and banks do not have to maintain capital. In case firms need fast financing, for example, because of an acquisition, banks provide a loan that has to be repaid within a year (*Het Financieele Dagblad*, January 26, 2000).

[27] However, the statistically insignificant coefficient of leverage in the debt maturity equation suggest that this effect is not reciprocal as we do not find that firm with lower leverage have more bank debt (rejection of B2b).

[28] See, *e.g.* Barclay and Smith (1995), Stohs and Mauer (1996), Barclay *et al.* (2003), and Johnson (2003).

(M2b) as predicted by Lewis (1990).[29] The coefficients on asset volatility (M3), and term premium (M1) are not significantly different from zero. Like in the leverage equation, the proxy for growth opportunities has no significant impact on debt maturity suggesting that debt maturity does not serve to mitigate moral hazard problems (M4). The statistically insignificant proxies for credit quality (firm size and its square) provide no evidence on Diamond's (1991a) prediction that both the best and the worst creditors rely on short-term debt (M9). Finally, firms in our sample do not seem to signal favorable private news by shortening their debt maturity given the insignificant measure of abnormal future earnings (M8).[30]

In the equation explaining the proportion of bank debt in a firm's capital structure we find a significantly positive effect of the collateral. This result suggests that banks prefer to extend loans to borrowers that are able to provide collateral to secure the bank debt. According to Berlin and Loeys (1988), firms with higher liquidation values benefit from borrowing from banks that ensure efficient liquidation (B8). On the other hand, we find no support for their hypothesis that firms with noisy interim indicators (B9) or higher probability of financial distress (B7), as proxied by the asset value volatility, or firms with low credit quality (B6) rely more on bank debt. The statistically insignificant coefficients on firm size (B4) and growth opportunities (B1a) do not confirm the expectation that bank debt decreases costs of informational problematic borrowers.[31] However, we also do not find any evidence that firms with high growth opportunities and weak bargaining power rely less on bank debt in order to avoid potential hold up problem (Rajan (1992)) (B1b and B5). All interactions between the growth dummy, which equals one if a firm's Q is above the sample year median and zero otherwise, and three proxies for the firm's strength vis-à-vis the bank yield insignificant results. The dummy approximating the lack of public debt market access is significantly positive and shows that firms without access to the public debt market rely significantly more on bank debt than other firms even after controlling for leverage. Finally, the stand-alone measures for the presence of a banker on the board and bank shareholdings are included in the bank-debt equation to diagnose whether firms with close relationships with banks have easier access to the bank. This hypothesis is rejected. The coefficient on bank shareholding is not significantly different from zero and the presence of a banker on the board even has a negative impact on the proportion of bank debt in a firm's capital structure.

[29] The estimated coefficient on marginal tax rate in the debt maturity equation does not suggest that the tax advantage of debt negatively affects debt maturity (M2a).

[30] Because theory suggests that signaling requires both positive private news and information asymmetry between the lender and the borrower, as a robustness check we have interacted the abnormal future earnings with some potential proxies of asymmetric information (such as firm size and dummy for a presence of the banker on the board), but the result remained qualitatively unchanged.

[31] The insignificant coefficient on firm size also does not provide support for the B10 hypothesis that the larger fixed part of public debt flotation costs makes bank debt more preferable for small firms.

In the model of this section, bankers on the board and bank shareholdings were included as explanatory variables for bank debt. However, as argued before, bank involvement through boards and equity holdings may go beyond influencing bank debt. In the next section we explore the effects of differing bank involvement in the firm on its capital structure.

3.5 Results: the role of banks in the capital structure choices

We begin the analysis of the role of banks in firms' financing choices by splitting our sample into four sub-samples. These sub-samples differ in the potential influence that a bank has over the firm's decision making besides providing debt financing. In particular, the distinction between the sub-samples is made according to the presence of bank shareholding and representation on the supervisory board. The first group consists of firm-years when the firm has no banker on the board and no banks among its shareholders. We refer to this group containing 358 firm-year observations as *NOB* (no-bank) group. In the second group, there are also no bankers on the board, but the bank shareholding is non-zero. We call this group (351 firm-years) the *BEQ* (bank equity) group. Firms in the third group have a bank representative on the board, but there are no bank shareholders. We name this group *BOB* (banker on the board) group and it has 192 firm-years. Finally, the fourth sub-sample consists of firms with both bank shareholding and banker on the board. This sub-sample with 304 observations is labeled as *BOBEQ* (banker on the board and equity). Table 3.4 provides comparison of the average firm characteristics for the four sub-samples.

The results of the equality of mean tests among the four groups presented in Table 3.4 reveal significant differences in their capital structures and other firm characteristics. The average NOB firm has a leverage, debt maturity and a bank debt ratio that is relatively close to the overall sample means (see Table 3.2). For this sub-sample it is typical that it includes small, growth firms with volatile asset returns and a lack of public debt financing. The BEQ group is characterized by the highest leverage (0.295) and reliance on bank debt (73% of total debt) and the lowest overall debt maturity. The only resemblance between BEQ and NOB firms lies in their small size and limited public debt issuance. Otherwise, BEQ firms have a high proportion of tangible assets (0.590) in their capital structure and low growth opportunities, suggesting that they are involved in capital-intensive operations. Firms with a banker on the board and without bank shareholdings (BOB) are described by the lowest indebtedness (0.217) and lowest proportion of bank debt (43% of the total debt).

Table 3.4: The comparison of means between the four groups based on the extent of bank involvement

This table compares means of the four groups, which are based on the extent of bank involvement. Group 1 consists of 358 firm-year observations with no bank equity and no banker on the board. Group 2 consists of 351 firm year observation with bank equity, but no banker on the board. Group 3 has 192 firm-year observations with no bank equity, only banker on the board. Group 4 includes 304 firm-year observations with both bank equity and banker on the board. All variables are defined in Table 3.1. The first four columns show means per group. The last six columns provide probabilities (p-values) of the equal mean test between two groups. The results for Tobin's Q are year independent. N.a. in case of mean test denotes that the test statistic could not be computed because the standard deviation within both groups is 0.

	Mean per group				*p*-values of the equal mean test					
	1	*2*	*3*	*4*	*1 vs 2*	*1 vs 3*	*1 vs 4*	*2 vs 3*	*2 vs 4*	*3 vs 4*
Bank equity	0.000	14.155	0.000	12.963	**0.000**	n.a.	**0.000**	**0.000**	0.146	**0.000**
Number of bankers on the board	0.000	0.000	1.830	1.800	n.a.	**0.000**	**0.000**	**0.000**	**0.000**	0.708
Leverage	0.246	0.295	0.217	0.257	**0.000**	**0.051**	0.372	**0.000**	**0.002**	**0.004**
Debt maturity	0.556	0.481	0.643	0.652	**0.002**	**0.001**	**0.000**	**0.000**	**0.000**	0.702
Bank debt	0.626	0.730	0.438	0.468	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	0.328
Firm size	11.397	11.553	13.729	13.540	0.186	**0.000**	**0.000**	**0.000**	**0.000**	0.229
Collateral	0.516	0.590	0.543	0.499	**0.000**	0.191	0.364	**0.006**	**0.000**	**0.023**
Taxation	0.273	0.280	0.280	0.309	0.745	0.799	0.141	0.995	0.120	0.184
Non-debt tax shields	0.012	0.039	0.047	0.047	**0.015**	**0.018**	**0.003**	0.144	**0.059**	0.963
Volatility	0.056	0.035	0.026	0.021	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.024**
Tobin's Q	1.760	1.381	1.616	1.343	**0.000**	0.204	**0.000**	**0.003**	0.512	**0.000**
Free cash flow	-0.007	0.021	0.025	0.024	**0.011**	**0.027**	**0.007**	0.358	0.357	0.772
Asset maturity	13.865	5.691	3.725	3.620	0.261	0.299	0.187	**0.077**	**0.022**	0.784
Abnormal future earnings	0.011	0.011	0.029	0.000	0.990	0.485	0.559	0.511	0.600	**0.024**
Profitability	0.054	0.084	0.088	0.091	**0.010**	**0.024**	**0.002**	0.535	0.784	0.628
Convertible debt dummy	0.092	0.130	0.160	0.260	**0.079**	**0.025**	**0.000**	0.476	**0.000**	**0.007**
Public debt dummy	0.031	0.026	0.240	0.250	0.683	**0.000**	**0.000**	**0.000**	**0.000**	0.832

The fact that over 60% of their debt has maturity longer than one year is likely to be contributed to their higher reliance on public debt (about a quarter of the firms). While it is not surprising that these are large firms, their average Tobin's Q of 1.616 is also among the highest in our sample. The reported means for the fourth sub-sample (BOBEQ) with firms with maximum bank involvement reveal that these firms are very similar to BOB firms in terms of their capital structure characteristics and size. Nevertheless, the BOBEQ sub-sample contains the most mature firms given the additional evidence of lowest asset value volatility (0.021) and low future growth opportunities (1.343).[32]

In the remainder of this section we explore to what extent the relationships between leverage, maturity and the source of debt are influenced by the strength of the ties with banks. To do so, we re-estimate the system of equations in model (1), while we allow the γ's to vary with the individual sub-samples. As a first step, we estimate a separate specification for each sub-sample. Next, for each characteristic we perform a Wald-test on the hypothesis that the impact of a particular variable is identical across the four sub-samples. In each case that the null hypothesis of parameter homogeneity is not rejected at the 10% significance level, we impose that the four sub-samples have identical coefficients for the corresponding explanatory variable.[33] This way, we prevent ending up with a specification with a large number of relatively inaccurately estimated coefficients. The result of this exercise is a simultaneous equations model where a subset of the coefficients, including those for the endogenous variables and excluding year and industry dummies, varies across sub-samples. In estimation, all instruments were interacted with dummies indicating sub-samples, which is consistent with an unrestricted specification for the reduced form equations. Table 3.5 shows the estimation results of the system of equations, taking into account the different ties with banks among the four sub-samples. In Panel A we report the coefficients and *t*-values for our three endogenous variables. For the sake of clarity we also present the estimated relationships graphically in Figure 3.2.

In general, the links among the capital structure characteristics remain fairly similar to those revealed in Table 3.3 and Figure 3.1. Nevertheless, controlling for the different types of bank involvement provides interesting additional insights. First, the results provide a clearer picture on the relationships between leverage and debt maturity. The coefficient on leverage in the debt maturity equation is the largest (with a value of 0.709) and significant at the 1% level for firms that lack close relationships with banks. With an increasing degree of bank involvement, the value of the coefficient steadily decreases.

[32] In an unreported comparison of bank debt maturity (long-term bank debt over total bank debt) among the four groups, we find that bank debt of BOB and BOBEQ firms is almost exclusively short-term (median of 0 and 0.107, respectively) in comparison to NOB and BEQ groups (median of 0.370 and 0.333, respectively).

[33] Estimation results for the four sub-samples, and the results of the Wald-tests for parameter homogeneity are available from the authors upon request.

Table 3.5: The effects of differing bank involvement on the simultaneity in capital structure choices

This table shows results for the simultaneous equations model, where the endogenous variables are leverage, debt maturity, and bank debt. The model is estimated using two stage least squares with Newey-West HAC standard errors and covariances. A constant, year dummies and fourteen industry dummies are included, though not reported. DNOB equals to one if firm neither has bank equity nor banker on the board, zero otherwise. DBEQ equals to one if firm has bank equity, but no banker on the board, zero otherwise. DBOB equals to one if firm has no bank equity, only banker(s) on the board, zero otherwise. DBOBEQ equals to one if firm has both bank equity and banker(s) on the board, zero otherwise. Variables are defined in Table 3.1 and Table 3.2. The total number of observations is 1205. *t*-values are in parentheses. The symbol '***' denotes that the estimated coefficient is significant at the 1% level; '**' at the 5% level; '*' at the 10% level.

	Leverage	Debt maturity	Bank debt
	Panel A: Endogenous variables		
Leverage × dNOB	-	0.709*** (3.498)	0.007 (0.021)
Leverage × dBEQ	-	0.570*** (3.724)	0.185 (0.861)
Leverage × dBOB	-	0.386** (2.154)	-0.351 (-1.144)
Leverage × dBOBEQ	-	0.141 (0.884)	0.114 (0.384)
Debt maturity × dNOB	-0.093 (-1.004)	-	-0.499*** (-3.443)
Debt maturity × dBEQ	0.135 (1.368)	-	-0.365** (-2.088)
Debt maturity × dBOB	-0.016 (-0.171)	-	-0.245 (-1.025)
Debt maturity × dBOBEQ	-0.040 (-0.395)	-	-0.541** (-2.183)
Bank debt × dNOB	-0.0004 (-0.005)	-0.500*** (-5.005)	-
Bank debt × dBEQ	-0.107 (-1.394)	-0.566*** (-6.048)	-
Bank debt × dBOB	-0.184*** (-3.011)	-0.219** (-2.250)	-
Bank debt × dBOBEQ	-0.158** (-2.244)	-0.390*** (-4.580)	-

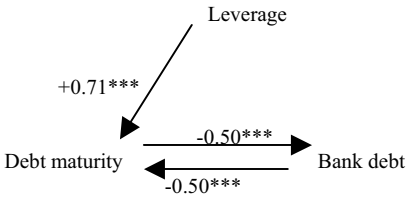
Table 3.5: The effects of differing bank involvement on the simultaneity in capital structure choices (continued)

	Leverage		Debt maturity		Bank debt	
	Panel B: Control variables					
Firm size	0.011**	(2.128)	0.036	(0.482)	-0.017*	(-1.831)
Tobin's Q	0.002	(0.227)	-0.004	(-0.306)	0.004	(0.284)
Tobin's Q × dBEQ	0.015	(0.705)	0.026	(1.238)	-	
Tobin's Q × dBOB	0.020	(1.327)	-0.038*	(-1.761)	-	
Tobin's Q × dBOBEQ	0.110***	(4.155)	0.052	(1.250)	-	
Asset volatility	0.066	(0.490)	0.008	(0.035)	-0.041	(-0.117)
Asset volatility × dBEQ	-		-		0.553	(0.864)
Asset volatility × dBOB	-		-		-2.636**	(-2.455)
Asset volatility × dBOBEQ	-		-		0.022	(0.014)
Collateral	0.281***	(5.231)	-		0.367**	(2.400)
Collateral × dBEQ	-		-		-0.149	(-0.860)
Collateral × dBOB	-		-		-0.349	(-1.322)
Collateral × dBOBEQ	-		-		-0.190	(-1.001)
Taxation	-0.033	(-1.563)	-0.017	(-0.540)	-	
Non-debt tax shields	-0.994**	(-2.340)	-		-	
Non-debt tax shields × dBEQ	-2.583***	(-3.231)	-		-	
Non-debt tax shields × dBOB	-1.748	(-1.602)	-		-	
Non-debt tax shields × dBOBEQ	-1.971***	(-2.591)	-		-	
Free cash flows	0.890**	(2.058)	-		-	
Free cash flows × dBEQ	2.380**	(2.504)	-		-	
Free cash flows × dBOB	1.271	(1.080)	-		-	
Free cash flows × dBOBEQ	0.160	(0.220)	-		-	
Term premium	-		-0.008	(-1.211)	-	
Asset maturity	-		0.0003***	(6.193)	-	
Asset maturity × dBEQ	-		0.003	(1.291)	-	
Asset maturity × dBOB	-		0.005	(0.659)	-	
Asset maturity × dBOBEQ	-		0.007***	(2.837)	-	
Abnormal future earnings	-		-0.008	(-0.194)	-	
Firm size squared	-		-0.001	(-0.463)	-	
Profitability	-		-		-0.052	(-0.562)
No public debt market access	-		-		0.249***	(5.761)
(High TQ) × no public debt	-		-		-0.043	(-1.216)
Banker on the board dummy	-		-		0.070	(0.531)
(High TQ) × banker dummy	-		-		0.069*	(1.707)
Bank shareholding	-		-		0.0007	(0.517)
(High TQ) × bank shareholding	-		-		-0.0003	(-0.209)

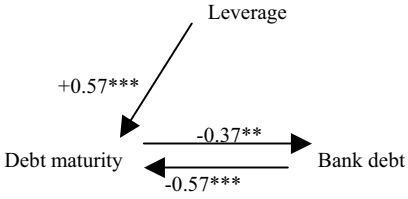
Figure 3.2: The estimated relationships between leverage, debt maturity and bank debt in the four groups depending on the extent of the bank involvement

This figure shows the estimated relationships between leverage, debt maturity and bank debt from Table 3.5 per bank involvement. The symbol '***' denotes that the estimated coefficient is significant at the 1% level; '**' at the 5% level; '*' at the 10% level.

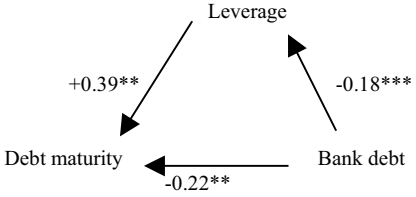
No bank equity, no banker on the board



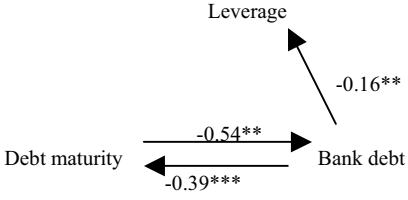
Bank equity, but no banker on the board



No bank equity, but banker on the board



Both bank equity and banker on the board



The debt maturity for the sub-sample of firms with strongest bank ties does not depend on leverage. The positive effect of leverage on debt maturity is consistent with the hypothesis that short-term debt increases liquidity risk, because firms with high leverage issue long-term debt to avoid sub-optimal liquidation (Diamond (1991a)) (M6b). Johnson (2003) suggests that this effect is the strongest for firms with low credit quality and limited possibility to obtain long-term debt. This is consistent with the different effects that leverage has on debt maturity in our sample in Figure 3.2. NOB and BEQ firms are rather small firms, largely dependent on bank debt financing, which tends to be short term. Therefore, firms with higher leverage should have more long-term debt as additional short-term debt would increase the likelihood of sub-optimal liquidation and the lack of close bank and public debt market relationships limits the possibility to promptly adjust the maturity structure of debt if needed. Although the other two groups of firms (BOB and BOBEQ) are probably higher quality borrowers, as they are more mature larger firms with less volatile returns, only about a quarter of them has access to the public debt market, which provides long term debt. In these groups the effects of leverage on debt maturity are less positive, because if liquidity risk becomes relevant the access to the debt market or the strong link to the bank enables the firm to easily extend its debt maturity structure.

Our results do not provide any evidence that the choice of debt maturity has influence on the leverage decision (L7), as the coefficient on debt maturity in the leverage equation is not significantly different from zero for any of the sub-samples. The overall results strongly suggest that firms (excluding firms with the closest bonds to banks) first determine their total debt level and subsequently optimize the maturity of the debt. The lack of easy access to various debt sources results in a positive impact of leverage on debt maturity, because short-term debt as opposed to long-term debt raises the likelihood of premature liquidation for firms with high leverage.

Another interesting result concerns the effects of bank debt on leverage. For the overall sample, we observe a significantly negative impact. A more detailed investigation in Panel A of Table 3.5 suggests that this result is driven by the two groups of firms with bankers on the board. This suggests that a seat on the board enables banks to exercise control over a firm's indebtedness. This evidence is consistent with the preference of banks for low risk customers (Carey *et al.* (1998)) (L8b).[34] The missing significant relationship between bank debt and leverage for NOB and BEQ firms suggests that without a bank representation on the board, the bank can only influence a firm's financing policy by granting or refusing to grant a loan, but cannot affect the overall debt level. It also provides

[34] In 2000, Dutch telecom firm KPN showed details of a credit facility to the Dutch Minister of Finance. Because the state owns shares and according to law all shareholders have the right to equal information, KPN had to publish the conditions of the bank loan, which would otherwise had never been revealed. The conditions concern maximum debt amounts, minimum profits and minimum interest coverage, which improve over time. Also dividends are forbidden and divestitures and investments limited (*Het Financieele Dagblad*, December 4, 2001). This example clearly shows that banks aim to reduce future leverage.

an additional confirmation of the weak position of the shareholders of Dutch firms. More specifically, one would expect that banks have the largest motivation to oversee the debt policy of firms in which they have a relatively large stake. A potential candidate for such supervision would be BEQ firms that on average have the highest leverage and almost three quarters of their debt originates from banks. Although the average bank shareholding in this type of firms is the highest (of 14%) compared to the rest of the sample, we see no relationships between the leverage and bank debt for this sub-sample. This is consistent with the findings of Daniševská *et al.* (2003) that in the Netherlands a supervisory board is effective in the influencing a firm's management, not shareholders.

Finally, the results for the relationship between the source of debt and its maturity are practically unchanged compared to those in Table 3.3. The effects of bank debt in the debt maturity equation are significantly negative for all groups. In the bank debt equation, debt maturity has a negative impact on bank debt and this effect is significantly different from zero in three out of four sub-samples. In the fourth (BOB) sub-sample the coefficient of debt maturity is negative with a *t*-value of -1.025. This provides very strong evidence for both the banks' specialization in providing short-term debt and for banks as the exclusive short-term debt source for Dutch firms (M7 and B3).

Table 3.5, Panel B shows results for the control variables in our simultaneous equations system that are generally consistent with those reported in Table 3.3 and discussed in the section 3.4. In addition, we find that in the sub-sample of firms with the strongest ties to banks, future growth opportunities have a significantly positive effect on leverage. Given that these firms are rather large mature firms with low growth opportunities, it seems that they are prone to overinvestment problems, but they avoid disciplining role of the debt. This finding is consistent with the empirical findings of De Jong (2002), who shows that Dutch firms that are likely to overinvest do not increase their leverage in order to self-restrain themselves. However, we also find that free cash flows positively affect leverage, which contrasts with the debt avoidance hypothesis. The significantly positive coefficient on firm size is consistent with the positive effect of the bankruptcy costs reduction on the optimal leverage. It suggests that large firms, which might be less likely to go bankrupt (*e.g.* due to better diversification), have more debt in the capital structure.

In the debt maturity equation the asset maturity (M5) remains the most prominent determinant of the maturity of debt (controlling for the total level and source of debt). In addition, we find that in the sub-sample of firms with a bank representation on the board, future growth opportunities have a negative effect on the debt maturity that is significant at the 10% level. This is consistent with Myers' (1977) mitigation of underinvestment problems by shortening debt maturity (M4). Furthermore, in the bank debt equation BOB firms with lower asset value volatility have significantly more bank debt, which further confirms Carey *et al.* (1998) hypothesis that banks prefer to provide loans to low risk

customers. The significantly negative coefficient on the firm size provides some support that banks can reduce the costs of informational problematic borrowers that small firms might be (B4). It is also in line with the flotation cost hypothesis, where large firms can afford the large fixed part of it and thus rely less on the bank debt (B10). An additional piece of evidence on the positive role of a banker on the board comes from the fact that firms with high growth opportunities and bankers on the boards have more debt monitored by banks.

3.6 Conclusions

This chapter investigates the role of firm-bank relationships in capital structure decisions of firms. We contribute to the current empirical literature in two ways. Firstly, we model the relations among three distinct capital structure choices: leverage, debt maturity and the source of debt. This approach is based on a view of debt as a heterogeneous financing source, which is described by maturity and the choice of lender. Our analysis emphasizes that the choice of the structure of debt is not independent from the debt-equity decision. Our simultaneous model thus involves three decisions, while existing studies focus at maximum at two decisions.

Secondly, and most importantly, this study contributes to the literature on firm-bank relationships. This strand of literature investigates the effects of firm-bank relations on the terms of bank loans provided to firms. This study takes a further step by examining whether banks are in a position to influence other capital structure decisions as well. We approximate the degree of involvement of a bank by the bank's shareholdings in a firm and its representation on the board.

Our results emphasize the importance of bank involvement in capital structure choice. We find that bank debt has a negative effect on leverage in firms with bankers on the board, while this relation is absent in the firms without bank involvement. This result suggests that banks maximize the value of their loans by reducing overall leverage. The finding is also consistent with the preference of banks for low risk loans (Carey *et al*. (1998)). We confirm Diamond's (1991a) liquidity risk theory because the absence of bank relations increases the effect of leverage on maturity. Bank involvement reduces liquidity risk. We find a strong trade-off between bank debt and maturity, which is independent of bank involvement.

The results in this study stress the costs and benefits of firm-bank relations. We study these phenomena in the Dutch setting, because we expect that the strong position of banks in this country magnifies the issues. We believe that in other bank-based systems, such as Germany, the documented relations can be also identified. Future research is needed to detect whether other types of firm-bank relations, possibly also in market-based systems, exhibit similar mechanisms to those that we have revealed in our study.

Chapter 4

Disciplining Managers: Evidence from Two-Tier Boards

4.1 Introduction

The shareholders of exchange-listed firms delegate the management of their firms to professionals. The shareholders appoint these professional managers and delegate them powers to look after their interests. Two plausible reasons, however, may prevent managers from maximizing shareholders' wealth. First, as argued by Jensen and Meckling (1976) and Jensen (1986), the objectives of managers and shareholders may diverge. As a result, managers waste company funds, for example, on perquisite consumption or on bad investments. The second reason is that the management is not capable of reaching levels of returns that satisfy shareholders. Irrespective of the reason, in case the shareholders expect that another management team can improve performance, the current management will be dismissed. However, the management will have the desire to remain in power and therefore the threat of turnover of management works as a disciplinary device. In this paper we measure the causes and wealth effects of disciplinary management turnover in the Netherlands.

As recent literature reviews by John and Senbet (1998) and Hermalin and Weisbach (2003) show, the literature on board turnover is largely empirical. The first strand of empirical work measures the performance-turnover sensitivity in order to assess whether poor performance induces forced turnover. The seminal papers are Weisbach

(1988) and Warner, Watts, and Wruck (1988), who, using U.S. data, show that the probability of CEO turnover indeed increases after low performance. Denis and Denis (1995) find that turnover is preceded by poor performance, but they also argue that the role of the board of directors is limited. In addition to this evidence for the U.S., evidence for European countries is provided by, among others, Kaplan (1994b), Franks, Mayer, and Renneboog (2001), Franks and Mayer (2001) and Volpin (2002). Kang and Shivdasani (1995) study Japanese firms. A few papers focus on turnover of executives other than the CEO. For example, Hayes, Oyer, and Schaefer (2002) find that CEO and non-CEO turnover are positively related, that this relation is persistent and not particularly related to bad performance. The second stream in the empirical literature measures and explains the wealth effects for shareholders. Examples are Furtado and Rozeff (1987), Warner *et al.* (1988) and Weisbach (1988) for U.S. firms. The results are mixed, but the average returns are economically very small. For a French sample, Dherment-Ferere and Renneboog (2002) find external successors to induce positive abnormal returns, in contrast with insiders.

In this study we investigate turnover in Dutch firms. In the Netherlands, all exchange-listed firms operate under a two-tier board structure. This structure is also mandatory in Germany and Austria, and optional in countries such as France and Finland. The first tier is the executive board, also referred to as the managerial board (*raad van bestuur*), chaired by a CEO. The second tier is the supervisory board (*raad van commissarissen*) and consists of the non-executive directors. Dutch corporate law prescribes that the supervisory board is independent of the company and is responsible for the supervision of the managerial board. This formal structure provides a clear separation of management and supervision. In one-tier boards, as common in the U.S. and the U.K., the distinction between executive and non-executive members is less clear and the independence of the non-executives is often not ensured. Given the independence of the supervisory board and their sole task to monitor the management team, we expect that managerial turnover in two-tier systems is more effective and efficient.

However, the practice in Dutch boards does not completely correspond with the legal requirements. Maassen and Van den Bosch (1999) confront the formal board structure in Dutch firms with reality, on the basis of 30 interviews with chairmen of supervisory boards. The results indicate that in 60% of the firms committees are formed, but nearly all these committees – mainly audit and remuneration – are composed of both supervisory and managerial board members. About 40% of the firms have a person on the supervisory board who is a former manager. Of the interviewees, 74% favor the appointment of a former manager, because of his experience. Of course, this relaxes the critical attitude they are supposed to show as independent supervisors. Finally, in 50% of the firms the supervisory board meetings are always attended by the entire managerial board; 25% of them have a single meeting per year without the management. In additional

to these empirical results, three observations emerge from the Dutch press. First, board members may have appointments in multiple firms, which potentially leads to conflicting interests. For example, the former CEO of Royal Dutch/Shell holds seven positions in Dutch supervisory boards (*FEM De Week*, November 4, 2000). Second, the supervisory boards are often referred to as an "old-boys network" in which consensus-building and maintaining good relations prevail over critical monitoring. As an illustration, between 1998 and 2001 the top 30 of influential board members did not change perceptibly (*Het Financieele Dagblad*, June 27, 2001). Finally, the skills and knowledge of board members may be insufficient to monitor properly. A nice illustration of the latter is the reaction of a supervisory board member of Ahold to the accounting irregularities that caused the share price to drop 63% in one day (February 24, 2003): "I don't feel responsible, I am not a business person" (*NRC Handelsblad*, April 15, 2003).

The Dutch firms have access to a developed public capital market for equity whereas, on the other hand, as La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998) describe, the shareholders of these Dutch firms have few rights in comparison with other countries.[35] On the anti-director right index of La Porta *et al.* (1998) evaluating the position of minority shareholders, Dutch firms score two out of the maximum of six, while the worldwide average is three and the U.S. and U.K. both score a five. The frequent use of shares with superior voting rights and shares without voting rights contributes to weaker position of shareholders, as it implies large deviations from the one share-one vote principle, one of the criteria of the shareholder rights of La Porta *et al.* (1998). Traditionally, financial institutions, and banks in particular, play a major role in the governance of Dutch firms. Dutch banks have multiple relations with firms, as they provide debt, equity, financial advice and derivative instruments and share board members with other firms.

We find that forced board turnover is highest among CEOs and lower among members of the managerial board. The fraction of departures of members of the supervisory board more than doubles in the year of CEO turnover, and in the years before and after. The result that supervisors leave before the CEO seems a clear sign of the weakness of the supervisors and their aim to protect their reputation. Managers other than the CEO are also more likely to leave at the same time as the CEO. We also measure a significant relation between lagged performance and forced departure of CEOs and other board members. The performance-turnover sensitivity is exclusively driven by internal forces, as the supervisory board characteristics are important. Both the size of the board and the presence of banks and financial institutions increase the disciplinary power of boards. On average, we find no significant wealth effects of CEO turnover. In explaining

[35] For example, in 1997 the Netherlands had the eighth largest market capitalization of the world (The Economist, April 26, 1997). Large international firms, such as Royal Dutch/Shell, Unilever, Philips and Heineken, are listed at the Amsterdam Exchanges.

the variation across abnormal returns, we find that interim succession and concentrated ownership tend to decrease abnormal returns, whereas forced turnover induces more positive wealth effects. We conclude that board structures of Dutch firms are determined within the board itself, which indicates that the institutional setting has a large impact on board effectiveness.

The remainder of the chapter is organized as follows. In section 4.2 we discuss the literature. Section 4.3 describes the data. The determinants of board turnover are studied in section 4.4. Section 4.5 presents the wealth effects of turnover and its determinants. Section 4.6 concludes.

4.2 Management turnover

The starting point of most of the literature is that CEO turnover should be triggered by poor performance, and this relation has been corroborated empirically.[36] As we mentioned earlier, Hermalin and Weisbach (2003) indicate that this is an extremely robust result in the literature (see *e.g.* Weisbach (1988) and Warner *et al.* (1988) for the U.S., Franks *et al.* (2001) for the U.K., Franks and Mayer (2001) and Kaplan (1994b) for Germany, Dherment-Ferere and Renneboog (2002) for France, Brunello, Graziano, and Parigi (2003) for Italy, Gispert (1998) for Spain, Lausten (2002) and Neumann and Voetmann (2001) for Denmark and Renneboog (2000) for Belgium). Turnover of executive board members other than the CEO has been studied less extensively. Fee and Hadlock (2002) study turnover of the top five executives and find that non-CEO turnover is highly concentrated around CEO dismissals, particularly when the new CEO is an outsider. Brunello *et al.* (2003) find, for Italian firms, that turnover of the four top executives is related to performance. Similar findings are presented by Hayes *et al.* (2002), who find that CEO and non-CEO turnover are positively related, and that this association is persistent in the sense that after CEO turnover, non-CEO managers are still likely to leave.

Given the different governance systems that prevail in the different countries, the question is how the turnover process takes place: what is the role of the different parties (*e.g.*, directors, large shareholders and banks) and what role board characteristics play (*e.g.*, board size, outsider versus insider-dominated). The main finding in this literature is that the sensitivity of turnover to performance is stronger when outsiders dominate the board, a result that had already been established by Weisbach (1988). Along with board composition, Weisbach includes size and a company's stock returns to explain the probability that the CEO loses his job. He finds that indeed board composition matters:

[36] There is a very large literature on board turnover. We only attempt here to highlight those strands most relevant to our study, and within those only the papers most relevant to ours. For literature surveys see Hermalin and Weisbach (2002), John and Senbet (1998) and, for a broader context, Shleifer and Vishny (1997).

outsider-dominated boards are more likely to fire a poorly performing manager, and this results in wealth creation for the shareholders.

Looking outside the U.S., Weisbach's study leads to the question of what the role of controlling shareholders and banks is. One would expect them to play an important monitoring role and therefore to strengthen the performance-turnover sensitivity. Kaplan (1994a and b) does not find support for this conjecture in Germany or in Japan, nor does Gispert (1998) in Spain, who actually finds the opposite (the turnover-performance relation is weakened by ownership concentration, while the nature of the controlling shareholders does not affect turnover either). In Italy, the relation between performance and turnover is weak or not significant when the controlling shareholder is also a top manager (Volpin (2002)) or in family-controlled businesses (Brunello *et al.* (2003)). The latter authors find also that changes in the controlling shareholder lead to more turnover. In Denmark, Lausten (2002) finds that family control weakens the relation between performance and turnover while Neumann and Voetmann (2001) find that institutional investors do not influence CEO turnover. Increased ownership concentration does not lead to more turnover in Belgium either (Renneboog (2000)). Kang and Shivdasani (1995) for Japan and Denis, Denis and Sarin (1997) for U.S. firms find evidence that the presence of blockholders strengthens the performance-turnover relation.

The role of banks is not straightforward, as banks play multiple roles: they are shareholders, debt providers, hold positions in supervisory boards and (mainly in Germany) hold larger voting than cash-flow rights. Van Oijen (2000) finds that in the Netherlands banks only exercise control when their loans are at stake, and the presence of a banker on the supervisory board increases CEO turnover when cash flow coverage of debt deteriorates. Booth and Deli (1999) find support for the hypothesis that the role of bankers on the board is to provide expertise, while they do not support the hypothesis that they are there to protect their loans.

Finally, several studies investigate wealth effects of CEO turnover. Although the results are mixed, on average, small wealth effects seem to follow managerial turnover. In the seminal paper, Warner *et al.* (1988) find significant negative returns after forced turnover, as well as a large dispersion in the abnormal returns. On the other hand, Furtado and Rozeff (1987) and Weisbach (1988) find significantly positive abnormal returns. Denis and Denis (1995) also show that positive wealth effects result when performance has deteriorated for three years. In the latter study the effect of anticipation is explicitly mentioned as an explanation for the economically small returns. Because the prior performance already induces expectations about management turnover, the price effect is underestimated in the event studies.

In the studies on wealth effects of CEO turnover the determinants of the abnormal returns are also studied. For example, Weisbach (1988) finds that if the board is dominated by executive directors wealth effects are lower. Worrel, Davidsaon, and Glascock (1993)

find that the announcement of a successor is the factor that leads to positive effects. For a French sample, Dherment-Ferere and Renneboog (2002) find that the appointment of an external successor leads to positive abnormal returns, while the appointment of an insider has the opposite effect.

Summarizing, the sensitivity of turnover to performance and the resulting wealth effects appear to be the main areas of interest concerning management turnover. The reviewed studies find several governance characteristics that explain the performance-turnover sensitivity and the wealth effects. Based on the characteristics of the Dutch boards and capital markets examined in the previous section, we hypothesize that board turnover is mainly an internal affair. This means that if any party has the power to discipline the top management, it is the supervisory board. However, given the anecdotal evidence on the attitudes in boards, it is an empirical question whether supervisors actually force timely turnover. Other parties have neither the means nor the incentives to discipline management. We do not expect shareholders to have the opportunities to drive turnover, because of the voting limitations in place. The banks may not have strong disciplinary forces through their role as debt and equity providers. Nevertheless, as banks share board members with firms, they may use this position on the board to safeguard their interests. We expect that the results of the event study examining the abnormal returns around the announcements of the forced departures depend on the timeliness of such turnovers. The realization of turnovers expected by the market should not to lead to significant abnormal returns. However, turnovers accompanied by such actions as the appointment of the interim replacements are hypothesized to negatively affect the abnormal returns as they indicate unforeseen events, and possibly even crisis situations.

4.3 Data

The sample in our study contains all non-financial firms listed on the Amsterdam Exchanges during the period 1992-1999. We start from yearly overviews of the securities listed at the Amsterdam Exchanges (*Gids bij de Officiële Prijscourant van de Amsterdamse Effectenbeurs*). In total, 208 firms were listed at least one full calendar year in the 1992-1999 period. We exclude firms with missing data or incomparable year-ends. We collect data from 1992 onward or starting from the year following the year of the firm's IPO and up till 1999 or the full calendar year preceding the last year of the firm's listing. Next, we require two years of subsequent data, because we use explanatory variables for board turnover with a one-year lag.[37] This requirement yields 958 firm-years for 174 firms.

[37] This requirement results in a loss of six firms due to their delisting at the beginning of the period and twenty-five firms due to their IPO at the end of the period. Another three firms are omitted due to incomplete data.

We consulted the firm's annual reports in order to find the managerial and supervisory board members in the years 1992 until 2000. This allows us to trace changes over the period 1993-1999. We also collect information on the reasons for the changes, as mentioned in the annual reports. For each board member who leaves a board or changes position, we search for the person's last name in the on-line version of the leading Dutch financial newspaper, *Het Financieele Dagblad.* We collect information on the date of the first announcement, the reason for the change, their age and successor (if mentioned) and contaminating announcements.

Financial data are obtained from the Review and Analysis of Companies in Holland (REACH) dataset and the firms' annual reports. Stock price information is from Datastream International. We measure firm size as the log of the book value of total assets in millions of Dutch guilders. Capital structure is measured by total debt over equity in book values. Bank debt is included as both long-term and short-term bank debt over the book value of total assets. Ownership structure information is obtained from *Het Financieele Dagblad*, in which a list of cumulated notifications for The Law on Disclosure of Shareholdings (*Wet Melding Zeggenschap*) is included annually. Variables measuring the ownership structure include the size of the largest blockholding (largest outside shareholder with ownership above 5%), the sum of the three largest blockholdings and the stake of the main types of specific blockholders (banks, financials, industrial firms and individual outsiders). Financials include banks, insurance firms, pension funds and venture capitalists. Inside blockholdings are measured as the percentage held by managerial board members and the percentage held by supervisory board members.

Many Dutch firms have legal arrangements that serve as protection against hostile takeovers. These takeover defenses may disturb the market for corporate control, but also disable the influence of shareholders on the management in the absence of a takeover threat. Priority shares are a limited number of shares that carry superior voting rights. The preferred-share construction allows the management team to issue preferred shares at 25% of their nominal value without additional shareholder approval. In case of a takeover threat, these shares are placed with a befriended party and the dilution creates an effective takeover defense. For firms with certificates, the shareholders own certificates that only carry the cash flow rights. The voting rights remain with a trust office, which is normally controlled by the managers. Takeover defenses are collected from the yearly overviews of all securities listed on the Amsterdam Exchanges (*Gids bij de Officiële Prijscourant van de Amsterdamse Effectenbeurs*). We use four dummy variables to account for the presence of each of the constructions above (structured regime, priority shares, preferred shares and certificates).

In principle, shareholders determine the composition of the supervisory board and the management board. However, in case a firm passes a size threshold it is legally obliged to adopt the so-called structured regime, under which supervisors' powers are further

strengthened. The most common form is the full structured regime, which is mandatory for Dutch companies with more than 100 employees, a legally installed work council and book value of shareholders' equity in excess of 25 millions of Dutch guilders.[38] Under this regime, the shareholders are forced to delegate most of their powers to the supervisory board, including the approval of the annual accounts, the election of the management board and the election of the supervisory board itself (so that the supervisory board indeed appoints itself). Besides, the supervisory board also has to approve of major decisions made by management.[39] Data on structured regimes are obtained from the report Monitoring Corporate Governance in Nederland (1998), Honée, Timmerman and Nethe (2000) and the firm's annual reports.

Board structure is captured by the number of members on the managerial (supervisory) board. Relative supervisory board size is the number of supervisory board members over the total number of people on both boards. Interlocking directorates are directorships in a firm in our sample held by individuals that also have a seat in other firms. The number of bankers on the board is the number of interlocking directorates between firms in our sample and Dutch banks. Similarly, financials on the board are the interlocks with all Dutch financials. Finally, the variable financial shareholding with interlock measures the percentage of ownership of financial firms that also have a joint director with the firm. Table 4.1 presents the summary statistics of the data set.

The capital structure of the firms shows an average debt-equity ratio of 2.158. Banks are important providers of debt to the firms, as on average total assets are financed with 7.9% short-term bank debt and 7.1% long-term bank debt.[40] Banks also hold an average of 7.41% of the shares and have on average 0.8 interlocking directorates. The broader set of financial firms owns 12.37%, has 1.051 interlocks while 1.24% of the shares is held by financials that also have at least one interlock.

[38] One Dutch guilder (NLG) equals about 0.45 EUR.

[39] There is an important exception to the legal requirements for the full structured regime. Firms with more than 50% of their employees outside the Netherlands are exempted. However, firms may voluntarily adopt either the structured regime even though it is not legally required. Several firms that adopted the regime after passing the size threshold choose not to abolish the regime later when over 50% of their employees where outside the Netherlands.

[40] Other forms of debt are public debt, non-bank private debt (*e.g.* institutional investors) and trade credit. Especially the latter form of debt financing is often used in addition to bank debt.

Table 4.1: Summary statistics for firms

This table reports summary statistics for the full sample of firms. Total observations is 958 firm-years for 174 firms over 1992-1998. Sources are annual reports, REACH, Datastream International, *Het Financieele Dagblad*, *Gids bij de Officiële Prijscourant van de Amsterdamse Effectenbeurs*. Monitoring Corporate Governance in Nederland (1998) and Honee, Timmerman and Nethe (2000). Firm size is the log of the book value of total assets in millions of Dutch guilders. Debt/equity is ratio of book values of total debt and equity. Bank debt is included as long-term (short-term) bank debt over the book value of total assets. Largest blockholding is the largest outside shareholder with ownership above 5%. Three largest (all) blockholdings are the stakes of the three largest (all) outside shareholders with ownership above 5%. The stakes of specific blockholders, *i.e.* banks, financials (banks, insurance firms, pension funds and venture capitalists), industrial firms, individual outsiders, managerial board chair and members and supervisory board include stakes above 5%. Dummy variables with a value of one if the construction is present and zero otherwise are included for the structured regime, priority shares, preferred shares and certificates. Managerial (supervisory) board size is the number of members of the managerial (supervisory) board. Relative supervisory board size is the number of supervisory board member over the size of both boards. The number of bankers (financials) on the board is the number of interlocking directorates between firms in our sample and Dutch banks (financial institutions). Financial shareholding with interlock is the percentage of ownership of financial firms that also have a joint director with the firm.

	Mean	Median	Standard deviation
Firm size	6.026	6.044	1.859
Debt/equity	2.158	1.504	5.029
Short-term bank debt/total assets	0.079	0.040	0.100
Long-term bank debt/total assets	0.071	0.033	0.088
Largest outside blockholding	26.954	19.020	21.501
Three largest outside blockholdings	40.671	36.160	25.638
All outside blockholdings	47.340	48.800	27.786
Bank shareholdings	7.410	5.060	10.300
Financial shareholdings	12.370	7.140	14.810
Industrial shareholdings	10.450	0.000	20.700
Individual shareholdings	14.113	0.000	21.121
Shareholdings chairman managerial board	3.771	0.000	13.148
Shareholdings members managerial board	0.754	0.000	5.363
Shareholdings supervisory board	1.970	0.000	10.340
Structured regime	0.580	1.000	0.490
Priority shares	0.390	0.000	0.490
Preferred shares	0.590	1.000	0.490
Certificates	0.370	0.000	0.480
Managerial board size	2.810	2.000	1.810
Supervisory board size	5.030	5.000	2.160
Relative size of supervisory board	0.650	0.667	0.123
Number of bankers on board	0.778	0.000	1.174
Number of financials on board	1.051	0.000	1.541
Financial shareholdings with interlock	1.240	0.000	3.270

The ownership structure is relatively concentrated: the largest outsider owns on average 27% and all block holders own on average 47%. However, the voting power is strongly reduced by the structured regime (58% of the firms), priority shares (39%), preferred shares (59%) and certificates (also known as depository receipts) (37%). The characteristics of the board structure indicate that the average firm has 2.81 managers and 5.03 supervisory board members. The chairman of the managerial board owns on average

3.77%, while an ordinary board member has a mere 0.75% of the firm. The chairman and members of the supervisory board only own 1.97% on average. All these characteristics indicate a strong role for financial firms and limited influence for shareholders. In the remainder of this paper we will investigate whether these institutional structures influence the effectiveness of the boards.

4.4 Determinants of management turnover

Our initial analysis focuses on the factors that drive management turnover. In the literature two motivations for turnover are distinguished, voluntary and forced turnover (*e.g.* Denis and Denis (1995)). Thus, the first step in our analysis is to classify turnover in the boards as voluntary or forced. We classify turnover based on the explanations in the firm's annual reports. If available, we also use newspaper articles in the Dutch financial daily (*Het Financieele Dagblad*). When the two sources report different motives we follow the newspaper, because this is a more objective source. We define the following motivations as voluntary turnover: retirement, reaching the age-limit, death, illness, reaching the maximum number of terms allowed, new position within the firm, new position outside the firm (provided new firm and position are explicitly mentioned) and restructuring of the ownership structure or the asset structure (takeover, merger, MBO). All other reasons like disagreements, poor performance and financial distress are labeled as forced turnover. We also classify turnover as forced when the motivation is absent or unclear. We assume that in case of voluntary turnover, firms will explain its nature to the shareholders and the financial press whereas in case of forced turnover firms may provide no reason or only a vague one. Therefore, we consider as forced the frequently used terms "personal reasons" and "own wish".[41] Table 4.2 presents the summary statistics on forced and voluntary turnover.

[41] In *Het Financieele Dagblad* of March 8, 2003 several examples are given of CEOs who, according to the firm's press releases, leave for personal reasons. A closer investigation shows that often the CEO is forced to leave. The covert terms not only serve to prevent the idea that the firm suffers from internal quarrels, but also to protect the future career of the CEO.

Table 4.2: Summary statistics for turnover

This table reports summary statistics for board turnover. Total number of observations is 958 firm-years for 174 firms over 1993-1999. Sources are annual reports and *Het Financieele Dagblad*. The number of people that leave their positions are mentioned, including the percentage of people relative to the total number of positions. In brackets the number of firm-years in which one or more people leave their positions are mentioned, including the percentage relative to the total number of firm-years.

	Managerial board chairman	Managerial board member	Supervisory board chairman	Supervisory board member	Both boards, member or chairman
Total turnover	117 12.21% [114 11.90%]	209 7.76% [167 17.43%]	102 10.65% [102 10.65%]	451 9.37% [326 34.03%]	879 9.33% [627 65.45%]
Forced turnover	49 5.11% [49 5.11%]	136 5.05% [109 11.38%]	29 3.03% [29 3.03%]	214 4.44% [170 17.72%]	428 4.54% [294 30.69%]
Voluntarily turnover	68 7.10% [68 7.10%]	73 2.71% [66 6.89%]	73 7.62% [73 7.62%]	237 4.92% [186 19.42%]	451 4.79% [334 34.86%]

The results in Table 4.2 show that in our sample 117 chairmen of the managerial boards (CEOs) left office. This is 12.21% relative to the 958 firm-years. In total turnover took place in 114 firm-years, which is 11.90%.[42] Out of the 117 turnovers, 49 were forced, which is 5.11% of the firm-years. For the members of the managerial board total turnover is 209, of which 136 are forced dismissals. If we compare the turnover with the total number of managerial board members over the years we find that the probability of turnover of a managerial board member is 7.76%, while the probability of forced turnover is 5.05%. Forced turnover of managerial board members occurs in 11.38% of the firm-years.

In comparison with the CEO, turnover of the chairman of the supervisory board is at 10.65% of the firm-years lower than the CEOs', and only 3.03% is forced turnover. On the other hand, members of the supervisory board have higher turnover. The probability of turnover of a supervisory board member is 9.37%, but the probability of forced turnover is 4.44%. Forced turnover of supervisory board members occurs in 17.72% of the firm-years.

So far, turnover has been described separately for each of the four positions. For total and forced turnover, it is interesting to describe mutual dependencies in turnover among different positions and across time. This allows us to investigate whether the departure of a chairman is preceded, accompanied or followed by departures of persons in other positions. The results are in Table 4.3.

[42] Our sample includes three firms where two CEOs left in a single year.

Table 4.3: Relation in turnover between boards

This table shows contemporaneous, lagged and leading relations between turnover of the chairman and other positions. Total number of observations is 958 firm-years for *t* and *t-1* and 784 firm-years for *t+1*. The number of people that leave their positions are mentioned and the percentage relative to the total number of positions. The average probability of turnover is from Table 4.2.

	t-1		t		t+1		Average probability
Panel A: Relation between the total *turnover of* managerial *board chairman and others*							
Managerial board chairman	10	8.55%	117	100.00%	10	11.11%	12.21%
Managerial board member	25	8.99%	32	9.82%	17	7.00%	7.76%
Supervisory board chairman	11	9.40%	15	12.82%	10	11.11%	10.65%
Supervisory board member	70	14.08%	78	12.96%	59	13.14%	9.37%
Panel B: Relation between the forced *turnover of* managerial *board chairman and others*							
Managerial board chairman	1	2.04%	49	100.00%	1	2.63%	5.11%
Managerial board member	10	9.17%	11	9.57%	2	2.70%	5.05%
Supervisory board chairman	0	0.00%	3	6.12%	5	13.16%	3.03%
Supervisory board member	20	9.71%	19	8.23%	20	11.43%	4.44%
Panel C: Relation between the total *turnover of* supervisory *board chairman and others*							
Managerial board chairman	12	11.76%	15	14.71%	9	10.98%	12.21%
Managerial board member	22	9.44%	25	9.26%	16	7.05%	7.76%
Supervisory board chairman	4	3.92%	102	100.00%	4	4.88%	10.65%
Supervisory board member	38	9.52%	59	11.59%	49	11.11%	9.37%
Panel D: Relation between the forced *turnover of* supervisory *board chairman and others*							
Managerial board chairman	5	17.24%	3	10.34%	0	0.00%	5.11%
Managerial board member	9	13.85%	6	8.57%	1	2.08%	5.05%
Supervisory board chairman	0	0.00%	29	100.00%	0	0.00%	3.03%
Supervisory board member	7	7.07%	16	14.41%	7	8.54%	4.44%

In Panel A of Table 4.3 the total turnover of the CEO is related to turnover of other officers. For example, 9.82% of the board members leave in the same year as the CEO, which is more than the average probability (7.76%) for this position. Also the turnover of the chairman and members of the supervisory board are higher, *i.e.* 12.82% and 12.96% versus 10.65% and 9.37%. For supervisory board member turnover is also higher in the year before (14.08%) and after (13.14%) the CEO leaves.

Panel B shows the results for forced CEO turnover. For non-CEO executives the results are similar. Given that forced turnover is related to performance (as we also confirm below), this is in line with the finding of Hayes *et al*. (2002) that turnover of non-CEO executives and CEOs are correlated, but this correlation does not depend on performance. Two clear results emerge with respect to the role of the supervisory board. First, in the year before forced CEO turnover there is no forced turnover found for the chairman of the supervisory board, while for members the probability is 9.71% instead of the average of 4.44%. The second particularly striking result is that supervisory board turnover is 13.16%

for the chairman and 11.43% for members in the year after a CEO is forced to resign, while the corresponding average figures are 3.03% and 4.44% respectively. This result can be caused by two effects. First, the successor of a dismissed CEO can influence supervisory board composition, by replacing the chairman and members. Alternatively, persons in the supervisory board may leave because their favored CEO is gone.

The results for the chairman of the supervisory board are in Panels C and D. The results are similar with one exception. In the years before and after turnover, the probability of turnover of the chairman is much lower and even zero in case of forced turnover. This implies that the position of chairman of a supervisory board rarely changes two years in a row. The overall conclusion is that turnover of a chairman of the managerial or supervisory board has a positive effect on the probability of turnover of other officers and the chairman of the other board. This effect is stronger in the year a chairman leaves and is also stronger for forced turnover.

Poor performance is expected to be an important motivation for forced turnover. In order to measure whether turnover is preceded by underperformance we estimate logit regressions where a binary variable with a value of one for forced turnover and zero for no turnover is explained by lagged measures of performance. The results are reported in Table 4.4. The first column in Table 4.4 investigates CEO turnover. First, stock returns in the years *t-1, t-2* and *t-3* are used to explain forced turnover versus no turnover in year *t*. The one-year lagged stock return shows a negative coefficient, significantly different from zero at the 1% level. This is in line with our expectations and with the literature (see Hermalin and Weisbach (2003)), because lower stock returns increase the probability of forced turnover. Because stock returns of an individual firm may be evaluated relative to a benchmark we also consider industry-adjusted returns.[43] We also consider accounting returns as measured by ROA and industry-adjusted ROA. The results are again highly similar. Finally, we include a dummy variable ("loss") with the value of minus one for firms reporting a negative operating income, and zero otherwise. The results confirm that only the results in the year before turnover matter significantly.

[43] Nine industries are defined based on Datastream's industry classification.

Table 4.4: Logit analysis of turnover and performance

This table shows results of the logit regression analysis that explains forced turnover versus no turnover in year *t* by performance measures in years *t-1, t-2* and *t-3*. An intercept and six year dummies are included (not reported). Stock return is the percentage increase in the firm's return index in Datastream. For the industry adjustment, nine industries are defined based on Datastream's industry classification. ROA is operating income over total assets. Loss is a dummy with value of minus one if operating income is negative and zero otherwise. The number of observations in each regression is 958 minus the firms with voluntary turnover and minus firms for which not data is available in *t-2* and *t-3*. *t*-values are in parentheses. * indicates significance at 10% level, ** at 5% level and *** at 1% level.

	Turnover chairman managerial board	Turnover member managerial board	Turnover chairman supervisory board	Turnover member supervisory board
Stock return t-1	-2.095*** (-3.560)	-0.444** (-2.450)	0.093 (0.178)	-0.059 (-0.586)
Stock return t-2	-0.687 (-1.349)	0.165 (0.998)	-1.020 (-1.571)	-0.250** (-2.292)
Stock return t-3	0.411 (0.874)	0.227 (1.263)	-0.823 (-1.274)	-0.039 (-0.347)
Adjusted R^2	0.088	0.008	0.057	0.011
Observations	826	828	823	714
Industry-adj. stock return t-1	-1.747*** (-3.667)	-0.331** (-2.057)	-0.210 (-0.427)	-0.074 (-0.784)
Industry-adj. stock return t-2	-0.483 (-1.122)	0.133 (0.854)	-0.398 (-0.823)	-0.240** (-2.389)
Industry-adj. stock return t-3	0.038 (0.082)	-0.089 (-0.509)	-1.234** (-2.053)	-0.026 (-0.252)
Adjusted R^2	0.083	0.005	0.058	0.011
Observations	826	828	823	714
ROA t-1	-4.834** (-2.085)	-2.840*** (-3.373)	-1.759 (-0.710)	0.815 (1.265)
ROA t-2	0.563 (0.196)	2.067* (1.634)	-5.895* (-1.777)	-3.137*** (-4.504)
ROA t-3	0.797 (0.284)	-0.040 (-0.037)	1.628 (0.471)	1.608*** (2.637)
Adjusted R^2	0.052	0.034	0.080	0.104
Observations	890	892	885	772
Industry-adj. ROA t-1	-4.419*** (-1.970)	-2.529*** (-2.982)	-2.844 (-1.212)	0.620 (1.032)
Industry-adj. ROA t-2	0.135 (0.048)	2.120* (1.668)	-3.517 (-1.084)	-3.230*** (-4.686)
Industry-adj. ROA t-3	1.107 (0.408)	-0.449 (-0.417)	1.990 (0.608)	1.891*** (3.030)
Adjusted R^2	0.051	0.029	0.071	0.101
Observations	890	892	885	772
Dummy loss t-1	-2.143*** (-4.308)	-0.265 (-1.087)	-0.962 (-1.373)	-0.142 (-0.949)
Dummy loss t-2	0.016 (0.022)	-0.017 (-0.062)	0.129 (0.144)	-0.608*** (-3.925)
Dummy loss t-3	0.979 (1.135)	0.350 (1.129)	-1.243* (-1.774)	0.126 (0.725)
Adjusted R^2	0.079	0.001	0.062	0.040
Observations	890	892	885	772
Industry-adj. stock return t-1	-1.230*** (-2.733)	-0.262* (-1.779)	0.121 (0.256)	-0.015 (-0.170)
Dummy loss t-1	-1.534*** (-3.348)	-0.090 (-0.402)	-1.293** (-2.122)	-0.369*** (2.651)
Adjusted R^2	0.097	0.007	0.050	0.016
Observations	890	892	885	772

Although we find that forced turnover is related to past poor performance, this does not imply that a lack of good performance always induces turnover. In an additional test (results not reported) we create a subsample of poorly performing firms with forced CEO turnover or no CEO turnover. Poor performance is defined as the industry-adjusted stock return in *t-1* in the two lowest deciles or with an operating loss in *t-1*. Of the 201 firm-

years in this sample, only 24 firms have forced turnover (*i.e.* 12%), while the remaining 177 observations show no turnover at all. A comparison of all governance variables (same as those included in Table 4.1) between poorly performing companies with and without turnover yields only one significant difference at the 10% level or less. The size of the supervisory board is larger for firms with forced turnover (5.04 versus 4.27 on average) and the difference is significant at the 5% level. These results strengthen our earlier findings.

In the second column of Table 4.4 the results for members of the managerial board are reported. The results strongly resemble the findings for the CEO. The only exception is the loss dummy, which turns out insignificant. We conclude that the pattern for both the chairman and members of the managerial board is robust and shows that forced turnover takes place in the year directly after poor performance and not two or three years later.[44] Moreover the impact of poor performance on the probability of turnover is economically as well as statistically significant. For example, if a firm's ROA is 1% lower than the industry average ROA, the probability of forced turnover increases by 4.4% for the CEO and 2.5% of one or more board members.

The results for the supervisory board chairman and members are in the third and fourth column, respectively. In each of the regressions, performance in *t-1* is never significantly related to turnover. For the chairman, three out of 18 coefficients are significant and have the expected sign. However, no clear pattern is found. The regressions for board members always yield significantly negative coefficients for *t-2*.[45] A potential explanation for this phenomenon is that supervisory board members are more likely to leave one year after the forced turnover of a CEO. As shown in Table 4.3 the overall probability of forced supervisory board member turnover is 4.44%, while 11.43% in the year after a CEO leaves. This implies that it is plausible that the result for supervisory board members is partially driven by CEO turnover and subsequent dismissals of supervisory board members.

The final row in Table 4.4 summarizes the key results for the largest sample possible, because only one lag is included. Both a stock market and an accounting-based measure are included to predict turnover. For CEO turnover the industry-adjusted stock return and the loss dummy at *t-1* are both significantly negatively related to turnover at the 1% level. If corporate governance characteristics indicate effective governance, we expect the performance-turnover relation to be more negative, because under effective governance

[44] The marginally significant positive coefficients on the (industry-adjusted) ROA in *t-2* are due to multi-collinearity between the one and two-year lagged variables (correlations are 0.76 and 0.75, respectively). If we exclude (industry-adjusted) ROA in *t-1* from the equation, the coefficient on the (industry-adjusted) ROA in *t-2* is not significantly different from zero. Moreover, the results of the unreported univariate tests do not suggest any significant differences in the (industry-adjusted) ROA in *t-2* between the subsamples with no turnover and forced turnover of managerial board members.

[45] The significant positive coefficients on the (industry-adjusted) ROA in *t-3* are again due to the multicollinarity problem. See the previous footnote.

poor performance is more likely to yield forced turnover. The inverse holds in case of ineffective governance. We investigate these hypotheses in Table 4.5.

For example, the row in Table 4.5 denoted "supervisory board size" contains a logit regression on forced CEO turnover, which is similar to the final row in Table 4.4. However, an interaction term is included for the industry-adjusted stock return at *t-1* and a dummy for supervisory board size above the median (high variable value).[46] In case the coefficient for the interaction term is significantly negative, CEOs with supervisory board size above the median face a higher probability of turnover in case of poor performance. For dummy variables, such as the structured regime, a high value corresponds to one, while the other group has zero. The coefficient for the interaction term is -1.719, which implies that the performance-turnover coefficient is -2.603 in the high board size subsample and -0.884 in the low board size subsample. The results indicate that board-related variables are relevant. We find that managerial and supervisory board size and bankers and financials on the board increase the disciplining through turnover if performance is lower.[47] Apparently, the board exerts some disciplinary power on a poorly performing CEO.

Overall, our results show that turnover in the managerial board is closely related to poor performance, irrespective of whether performance is measured as stock returns or as accounting-based income. The performance-turnover relation is stronger for CEOs than for board members. Board characteristics such as supervisory board size and bankers and financials on the board increase the impact of poor performance on disciplinary CEO turnover. For the second tier, *i.e.* the supervisory board, we have the following three conclusions. First, supervisory board chairman and member turnover is hardly related to financial performance. Second, an indirect effect arises because supervisory board member turnover is higher in the year before and after a CEO is forced to leave. Third, the size of the supervisory board strengthens the performance-turnover relation.

[46] We also performed a robustness test in which we additionally included the governance variable (results not reported). The sign of significant coefficients is not altered in any of the regressions.

[47] An exception is the presence of certificates, which strengthens the performance-turnover relation. We have no explanation for this result.

Table 4.5: Logit analysis of turnover, performance and governance characteristics

This table reports results of the logit regression analysis that explains forced turnover versus no turnover in year *t* by performance and governance in year *t-1*. An intercept and six year dummies are included (not reported). Stock return is the percentage increase in the firm's return index in Datastream and for the industry adjustment, nine industries are defined based on Datastream's industry classification. Loss is a dummy with value of minus one if operating income is negative and zero otherwise. High variable value indicates a value above the median or for dummy variables a value of one. *t*-values are in parentheses. The number of observations in each regression is 890. * indicates significance at 10% level, ** at 5% level and *** at 1% level.

	Operating loss dummy	Industry-adjusted stock return t-1	High variable value × Industry-adjusted stock return t-1	McFadden R^2
Firm size	-1.640*** (-3.554)	-0.814 (-1.530)	-1.140 (-1.483)	0.103
Debt/equity	-1.539***(-3.349)	-1.557*** (-2.684)	0.637 (0.877)	0.099
Bank debt/total assets	-1.620***(-3.460)	-0.850 (-1.166)	-0.241 (-0.497)	0.107
Largest outside blockholding	-1.609*** (-3.462)	-1.770*** (-3.066)	1.090 (1.461)	0.103
Three largest outside blockholdings	-1.550*** (-3.365)	-1.564*** (-2.676)	0.653 (0.888)	0.099
All outside blockholdings	-1.556*** (-3.368)	-1.667*** (-2.839)	0.839 (1.144)	0.101
Bank shareholdings	-1.625*** (-3.532)	-0.759 (-1.371)	-1.061 (-1.455)	0.103
Financial shareholdings	-1.618*** (-3.518)	-0.766 (-1.373)	-1.024 (-1.402)	0.102
Industrial shareholdings	-1.512*** (-3.278)	-1.358*** (-2.579)	0.360 (0.463)	0.098
Individual shareholdings	-1.518*** (-3.284)	-0.709 (-1.182)	-0.975 (-1.322)	0.102
Shareholdings chairman manag. board	-1.500*** (-3.231)	-1.117** (-2.345)	-0.714 (-0.722)	0.099
Shareholdings members manag. board	-1.482*** (-3.163)	-1.083** (-2.319)	-1.356 (-1.106)	0.101
Shareholdings supervisory board	-1.550*** (-3.377)	-1.203*** (-2.652)	-1.395 (-0.508)	0.098
Structured regime	-1.546*** (-3.328)	-1.176** (2.091)	-0.119 (-0.159)	0.097
Priority shares	-1.564*** (-3.415)	-1.543*** (-2.781)	0.709 (0.954)	0.100
Preferred shares	-1.523*** (-3.326)	-1.616** (-2.402)	0.586 (0.777)	0.099
Certificates	-1.569*** (-3.426)	-0.808 (-1.587)	-1.431* (-1.880)	0.107
Managerial board size	-1.687*** (-3.666)	-0.758 (-1.438)	-1.323* (-1.738)	0.105
Supervisory board size	-1.705*** (-3.659)	-0.884* (-1.813)	-1.719** (-1.929)	0.107
Relative size of supervisory board	-1.537*** (-3.357)	-1.128** (-2.167)	-0.299 (-0.393)	0.097
Number of bankers on the board	-1.745*** (-3.754)	-0.755 (-1.510)	-1.825** (-2.219)	0.110
Number of financials on the board	-1.798*** (-3.859)	-0.646 (-1.272)	-2.039** (-2.525)	0.114
Financial shareholdings with interlock	-1.521*** (-3.285)	-1.253*** (-2.695)	0.286 (0.196)	0.097

4.5 Wealth effects of turnover

In the previous section we have investigated the causes of board turnover. In this section we measure the shareholders' reactions to turnover of the chairman of the managerial and supervisory boards. We take as a starting point the 117 and 102 changes of the chairman of the managerial and supervisory boards. In the Dutch financial daily *Het Financieele Dagblad* we apply a keyword search between 1 January 1993 and 31 December 1999 on the chairman's last name and we read all articles in order to trace the first announcement of the resignation. In total we have 112 announcements, 84 for the CEO and 28 for the supervisory board chairman.

The announcement effects are measured following the standard event study methodology as described in MacKinlay (1997). We apply the market model to measure normal returns, *i.e.* an OLS regression of the firm's return on an intercept and the market index. The market index chosen is the CBS index for the Dutch market provided by Datastream. Denoting the announcement date as day 0, this estimation period ranges from day -120 to day -20. The event window ranges from day -1 to day +1. There are five events with extreme values of cumulative abnormal returns removed from the total sample.[48] The results for the event study are in Table 4.6.

The cumulative abnormal returns in Panel A of Table 4.6 show that for the 32 forced departures of CEOs the average return is -0.538% and the median is 0.186%. Five announcements are made jointly with the firm's earnings and these contaminations strongly influence the results. According to Panel B in the 48 cases of voluntary CEO turnover the average cumulative abnormal return is 0.391%. Again earnings announcements influence these results.[49] Therefore we confirm the general finding in the literature of small wealth effects after managerial turnover. Denis and Denis (1995) argue that the relatively small effects may be caused by the expectation that the CEO will leave due to prior poor performance, which is already discounted in the stock price. Although we also find a very small average effect, there are two reasons why this explanation is not likely to be valid in our case. First, as we explained in the previous section, only in 12% of cases CEOs are forced to leave following poor performance, which suggests rather low predictability of this event. Second, the reported standard deviations in Panel A and B of Table 4.6 indicate that individual cumulative abnormal returns are not that small.

[48] Outliers are observations with absolute abnormal returns above 15%.

[49] The observed differences between the mean and median cumulative abnormal returns in Table 4.6 are likely to be caused by a low number of observations. We do not see that means would be consistently larger (or smaller) than medians, which would suggest that our data are skewed in a particular way.

Table 4.6: Stock price reactions to chairman departures

This table shows cumulative abnormal returns in percent over days (-1, +1) for the announcements of departures published in *Het Financieele Dagblad* between 1 January 1993 and 31 December 1999. CARs are calculated using an OLS market model regression. There are four events with extreme values of CARs removed from the total sample consisting of 84 events. * indicates significance at 10% level, ** at 5% level and *** at 1% level.

	Mean	Median	Standard deviation	N
Panel A: Chairman managerial board forced departures				
All	-0.538	0.186	5.253	32
No earnings announcement	-0.410	0.251	5.233	27
Positive earnings announcement	4.244*	4.244	2.329	2
Neutral earnings announcement	-	-	-	0
Negative earnings announcement	-4.872***	-2.464	4.212	3
Panel B: Chairman managerial board voluntary departures				
All	0.391	-0.193	3.103	48
No earnings announcement	-0.306	-0.437	2.182	33
Positive earnings announcement	4.100***	3.075	4.064	7
Neutral earnings announcement	0.063	0.063	0.261	2
Negative earnings announcement	0.013	-1.389	4.185	6
Panel C: Chairman supervisory board forced departures				
All	2.031	0.930	4.060	7
No earnings announcement	2.375	0.930	3.483	5
Positive earnings announcement	-	-	-	0
Neutral earnings announcement	-	-	-	0
Negative earnings announcement	1.174	1.174	6.953	2
Panel D: Chairman supervisory board voluntary departures				
All	0.075	-0.088	3.031	20
No earnings announcement	-0.306	-0.213	1.650	13
Positive earnings announcement	4.504*	3.075	3.710	3
Neutral earnings announcement	0.214	0.214	-	1
Negative earnings announcement	-2.750**	-1.737	3.851	3

Panels C and D contain the results for changes in the chairman of the supervisory board. Forced departures lead to an average abnormal return of 2.031%. As expected, the return is lower for voluntary turnover, being only 0.075%. Earnings announcements are also found to influence the results. We conclude from Table 4.6 that, after correcting for contaminated announcements, average and median abnormal returns are small and insignificant. Besides, the number of observations for supervisory board turnover is low. However, the standard deviations of the abnormal returns are high, which indicates dispersion among the abnormal returns. In the remainder of this section we aim at explaining the abnormal returns for CEOs.

We perform regressions in which the cumulative abnormal return is explained by information provided in the announcements and governance characteristics. As discussed in De Roon and Veld (1998), OLS regressions are not likely to be efficient, because the

abnormal returns are calculated as residuals from the market model and the resulting abnormal returns actually measure firm-specific risk, which differs between firms. We reduce this heteroskedasticity in order to improve the efficiency of the estimates by applying weighted least squares regressions (WLS). We weigh by firm-specific risk, *i.e.* the dependent and independent variables are divided by the standard error from the market model in the estimation period. Although we have 80 observations for departures of chairmen of the managerial board, we choose to omit 18 observations because the announcements are contaminated with an earnings announcement. As Table 4.6 shows, this contamination influences the results. The results of the WLS regressions are in Table 4.7.

In column (1) of Table 4.7 we estimate whether news about the successor influences the abnormal return. The abnormal return in case the successor of the CEO is an outsider (13 announcements) does not differ significantly from inside succession. In 12 cases the definitive succession is not reported, but an interim CEO is appointed. Consistently with the findings of Worrel *et al.* (1993), this has a negative impact on the abnormal return of -4.4%, which is significant at the 1% level. There are two reasons for this negative effect. First, the installation of an interim CEO implies that the departure was not foreseen and indicates a crisis situation. Second, the interim nature of the new position will affect the power and foresight of the temporary CEO.

In column (2) we include a dummy variable for forced turnover and the industry-adjusted stock return. Announcements with forced turnover have a 1.7% higher abnormal return, and this is significant at the 5% level. These results imply that forced turnover is good news, because the prospects of the firm are expected to improve. This has been found in other studies (*e.g.* Furtado and Rozeff (1987)) where as in Dhermente-Ferere and Renneboog (2002) this result is only true when an external successor has been appointed. Unlike in Denis and Denis (1995), the return has no significant coefficient. The effect of past returns is already partially included through the dummy for forced turnover, because this variable is correlated with past performance. However, the impact of this anticipation in our sample is small. The model remains qualitatively unchanged when we omit forced turnover. The coefficient on the industry-adjusted stock return is negative, but not different from zero at the standard significance levels (results not reported). An obvious explanation for this result is that in Dutch firms the probability of forced turnover is relatively small in poorly performing firms.

Table 4.7: Determinants of stock price reactions

The table reports results of the weighted least squares regression on cumulative abnormal returns in percent over days (-1, +1) for the announcements of departures published in Het Financieele Dagblad between 1 January 1993 and 31 December 1999. CARs are calculated using an OLS market model regression. Total number of observations is 62. *t*-values are in parentheses. All variables are defined in Table 4.1. * indicates significance at 10% level, ** at 5% level and *** at 1% level.

	(1)		(2)		(3)		(4)		(5)		(6)	
Intercept	-0.002	(0.67)	-0.004	(-1.15)	0.006	(0.80)	-0.002	(-0.31)	-0.013	(-1.55)	-0.012	(-1.15)
Successor is outsider	-0.006	(0.69)	-		-		-		-		-	
Successor is interim	-0.044***	(-4.85)	-0.056***	(-5.37)	-0.051***	(-4.73)	-0.054***	(-4.83)	-0.054***	(-4.95)	-0.052***	(-4.90)
Forced turnover	-		0.017**	(2.32)	0.014*	(1.84)	0.015*	(1.85)	0.014*	(1.85)	0.015*	(1.94)
Ind.-adj. stock return t-1	-		-0.013	(-1.27)	-0.015	(-1.32)	-0.016	(-1.44)	-0.011	(-0.99)	-0.015	(-1.33)
Debt/equity	-		-		-0.002	(-0.72)	-		-		-	
Bank debt/total assets	-		-		0.027	(0.96)	-		-		-	
All outside blockholdings	-		-		-0.0002*	(-1.77)	-		-		-	
Financial shareholdings	-		-		-		-0.00002	(-0.06)	-		-	
Industrial shareholdings	-		-		-		-0.0001	(-0.98)	-		-	
Individual shareholdings	-		-		-		-0.0001	(-0.18)	-		-	
Managerial board shareholdings	-		-		-		0.0003	(0.53)	-		-	
Supervisory board shareholdings	-		-		-		0.0003	(0.44)	-		-	
Structured regime	-		-		-		-		0.004	(0.41)	-	
Priority shares	-		-		-		-		-0.001	(-0.08)	-	
Preferred shares	-		-		-		-		0.004	(0.49)	-	
Certificates	-		-		-		-		0.010	(1.33)	-	
Supervisory board size	-		-		-		-		-		0.003	(1.09)
Number of financials on board	-		-		-		-		-		0.001	(0.11)
Financial shareholdings with interlock	-		-		-		-		-		-0.002	(-1.53)
Firm size	-		-		-		-		-		-0.001	(-0.37)
Adjusted R^2	0.269		0.336		0.339		0.229		0.320		0.327	

In columns (3) to (6) we include corporate governance variables. First we include measures for the firm's financial structure, *i.e.* leverage, bank debt and blockholdings. Only the sum of all blockholdings yields a significant coefficient, at the 10% level. The negative sign indicates that blockholdings lead to more negative announcement effects. In additional tests (not reported) we include the largest and the three largest blockholders, and the results are similar. Column (4) contains the identity of the shareholders, and none of the coefficients are significant. Takeover defenses are included in column (5) and, again, none of the relations are found to be significant. Finally, we investigate board characteristics in column (6). The size of the supervisory board has no effect on the abnormal returns. Additional tests for managerial board size and relative supervisory board size (not reported) show similar results. The relations with financial firms already turned out of insignificant importance for bank debt and financial shareholdings. Also results for financial interlocks and interlocks with equity ownership are found to be insignificant.

The analysis of the abnormal returns yields four interesting results. First, forced turnover yields a significantly higher abnormal return than voluntary turnover. Second, an interim successor leads to a significantly lower abnormal return. Third, concentrated ownership is negatively correlated with abnormal returns. Fourth, capital structure, identity of shareholdings, takeover defenses, firm-bank relations and board structure are not related to the abnormal returns.

4.6 Conclusions

This paper investigates board turnover in the Netherlands. Dutch corporate law mandates a two-tier board system with a separate second tier (supervisory board) monitoring the managerial board. The powers of the supervisory board are relatively strong, for two reasons. First, in many firms the Dutch corporate law forces shareholders to delegate power to the supervisory board. Second, shareholders are limited in their voting power by takeover defense measures that reduce their voice in general. As a result, the supervisory board may not have the incentives to monitor the managerial board. In addition, financial institutions play an important role in Dutch firms, as providers of debt and equity financing. Moreover, these institutions share board members with industrial firms and can exert influence along these lines.

Our findings indicate that forced board turnover occurs most often among CEOs and to a lesser extent among members of the managerial board. Forced turnover is lower in the supervisory board. We find that the probability of departure of members of the supervisory board more than doubles in the year of CEO turnover and the years before and after, indicating these departures are related to CEO turnover. We find a strong relation between a forced departure in the managerial board, both by CEO and by other members, and performance in the preceding year. However, poor performance does not always

induce forced turnover. In our subsample of poorly performing firms, only 12% of CEOs are forced to leave their positions. The governance characteristics that seem to increase the probability of turnover in case of poor performance are board size and bankers or financials on the board. It is striking that these variables are all internal forces, while, *e.g.*, debt and the ownership structure have no effect.

The wealth effects for shareholders of turnover of the chairman of the managerial and supervisory boards are insignificant on average. However, the dispersion in the results is large. We explain part of the stock price reaction for CEOs. First, interim succession has a negative effect and forced turnover a positive effect. Second, concentrated ownership has a negative effect. A summary of the results of the performance-turnover relation and the wealth effects shows that the former is mainly determined by internal forces, while the latter is not related to internal governance characteristics. The role of banks and other financials is an interesting example. These financials influence turnover through the boards, while debt and equity financing yields no results. Arguably, board structures of Dutch firms are determined within the board itself. This result is easily explained by the disability of shareholders to discipline management.

Chapter 5

Differences of Opinion and the Cross Section of European Stock Returns

5.1 Introduction

This chapter investigates whether the dispersion of analyst forecasts bears a relationship to stock returns in European equity markets. Divergence of analysts' opinions can be viewed as a measure of differences of opinion among investors. Several theoretical models predict that forecast dispersion has a negative relation with future stock returns. The basic idea dates back to Miller (1977) and is intuitively very simple. Miller argues that uncertainty about the true return on the investment in a security is likely to imply that potential investors make different estimates of the expected returns from the investment. If short-selling constraints deter pessimistic investors from shorting the stock, the stock price will reflect the expectations of the optimistic investors. When the best estimate of the stock price is the average investor opinion, the price of a security will be too high relative to the fundamental value and subsequent returns will be low.

Since the publication of Miller's paper, a substantial body of theoretical literature has developed that studies the effect of heterogeneous beliefs on asset pricing. Some of these papers rely on behavioral arguments and attribute differences in opinions to non-rational investor behavior (*i.e.* overconfidence). Other models assume a type of bounded rationality, entailing investors that are not perfectly able to make inferences from common information sets. A third strand of the literature conjectures that investors are fully rational,

but information is asymmetric in the sense that some investors receive private information signals. All models predict that asset prices are affected by differences in opinions.

The empirical evidence on the relationship between divergence of opinions and stock returns is remarkably limited. Following Figlewski (1981), various papers have examined the relationship between the actual number of shares of a stock sold short (the "short interest") and subsequent returns. The underlying rationale is that the short interest is a measure of the amount of pessimistic information that would be divulged in stock prices if there were no short-sale constraints. The empirical findings are mixed. Early evidence indicates that short interest does predict subsequent equity returns, while later studies, *e.g.* Brent, Morse, and Stice (1990), find no relationship. Besides several pitfalls in the empirical estimation of this relationship, it is obvious that short interest is a very crude measure of divergence of opinions. Chen, Hong, and Stein (2002) argue that breadth of ownership, defined roughly as the number of investors with a long position in a particular stock, is a more reliable proxy for differences of opinion. The lower the breadth for a stock, the larger the number of investors that are not active in the market, suggesting that their pessimistic valuations are not conveyed in the stock price. Using data on mutual fund holdings, the authors find support for Miller's theory.

We focus on a clear-cut and intuitively appealing proxy for divergence of opinion among investors: the dispersion in analyst earnings' forecasts. This measure has received remarkably little attention in the literature to date. An exception is Diether *et al.* (2002), who analyze the relationship between forecast dispersion and stock returns for a sample of NYSE, AMEX, and Nasdaq stocks over the period 1976-2000. They report that stocks in the lowest quintile of dispersion outperform stocks in the highest dispersion quintile by almost 9.5 percent per annum. Their result is robust to various adjustments for risk and inconsistent with the view that dispersion in analyst forecasts is a proxy for risk.

To our knowledge, our paper is the first empirical study of the relationship between the divergence of investor opinions and stock returns in European equity markets. We examine whether stocks with low dispersion in analysts earnings' forecasts outperform stocks with high dispersion for France, Germany, the Netherlands, and the U.K. over the period 1992-2003. We use earnings estimates from the Institutional Brokers Estimate System (I/B/E/S) [50] in order to calculate monthly forecast dispersions. In total, we analyze 193,437 firm-month observations for 3,028 firms. Our results indicate a strong negative relationship between forecast dispersion and subsequent stocks returns for France, Germany, and the Netherlands. For the U.K., the relationship seems essentially flat. The return differential between low and high dispersion quintiles lies between roughly 5 percent per annum for the Netherlands to almost 15 percent for Germany. The effect of

[50] The author gratefully acknowledges the contribution of Thomson Financial for providing earnings per share forecast data, available through the I/B/E/S – Institutional Brokers Estimate System. This data has been provided as part of a broad academic program to encourage earnings expectations research.

dispersion on stock returns is highly persistent. Even when portfolios are held for a period of 12 months, excess returns amount to over 50 basis points per month for all countries except the U.K.

We show that the dispersion effect can to a large extent be attributed to the stocks in the highest quintile of dispersion. In contrast to Diether *et al.* (2002), we also analyze the development of forecast dispersion over time. We report evidence of mean reversion in the dispersion of forecasts. However, even 12 months after portfolio formation stocks in the highest dispersion quintile still have a substantially higher level of dispersion than stocks in the other quintiles. The volatility of returns of the high dispersion quintile is consistently higher than the volatility of the other quintiles for all countries in the sample, suggesting that the dispersion in analyst forecasts cannot be interpreted as an ex-ante risk measure. We provide further evidence on the risk and return characteristics of the dispersion quintiles employing a multifactor asset pricing model incorporating risk factors related to size, book-to-market, and momentum. For Germany, the evidence of a relation between dispersion and returns after controlling for systematic risk is strong. Risk-adjusted monthly excess returns amount to 100 basis points for the one-month horizon and over 50 basis points for longer horizons. Adjusting the French portfolio returns for systematic risk results in excess return of roughly 50 basis points per month for all horizons. For the Netherlands, the dispersion effect is largely absorbed by systematic risk factors for the one-month horizon, but high dispersion stocks underperform low dispersion stocks by 56 basis points on a risk-adjusted basis for the horizon of 6 months. Overall, our evidence supports Miller's theory of heterogeneous expectations for three out of the four countries analyzed.

An important contribution of our research is that we show that the relationship between forecast dispersion and stock returns is dependent on the stock market situation. Hong and Stein (2003) develop a model of stock market crashes with heterogeneous expectations and short-sales restrictions. Their model predicts that in a rising market, pessimistic investors are sidelined by the restrictions on short-selling. However, in a declining market, the pessimistic investors become the marginal investors. Hence, accumulated hidden information becomes manifest in falling markets. Taking the dispersion in analyst forecasts as a measure of the heterogeneity of investors' expectations and thus of the amount of hidden information, we expect high dispersion stocks to experience stronger price declines in bear markets. We partition our sample period in four different subsamples: normal, bubble, down-market, and recovery period. The findings indicate that there is a strong and highly significant relationship between dispersion and subsequent stock returns in the declining market for all countries. On average, stocks with low dispersion achieve an excess return of almost 200 basis points per month in this period. In the other periods, there is a moderately negative relationship between dispersion and returns, except for the U.K., where we find a positive relationship in the normal and

bubble periods. More theoretical and empirical research is required in order to fully understand the effect of heterogeneous beliefs on the cross-section of returns in bubbles and in periods of sharp price declines.

The remainder of the chapter is structured as follows. In section 5.2 we discuss the literature and formulate hypotheses. Section 5.3 describes the data and methodology. Section 5.4 analyses the relationship between dispersion and stock returns. The dispersion effect in different stock market environments is studied in section 5.5. Section 5.6 concludes.

5.2 Literature and hypotheses

Since the research of Miller (1977), a large number of articles have examined the implications of relaxing the standard assumption of homogeneous expectations in asset pricing models. Miller contends that in the presence of short-sales constraints, stock prices will reflect the valuations of optimists and not the valuation of pessimists. Miller's argument is intuitively appealing for two reasons. Firstly, the assumption of homogeneous expectations seems unnecessarily restrictive in the light of the enormous uncertainties that investors face in actual financial markets. Even when investors would receive the same information signals, it is unlikely that no differences in their inferences about the fundamental value arise.[51] Other theoretical models that predict a relationship between heterogeneous beliefs and the cross-section of stock returns include Harrison and Kreps (1978), Jarrow (1980), Mayshar (1983), Morris (1996), Chen *et al.* (2002), and Hong and Stein (2003).

Secondly, several recent studies provide evidence that short-sales restrictions are important in practice. D'Avolio (2002) offers a description of the market for borrowing and lending stock in the U.S. This market is generally very active and liquid, but for some stocks and in some situations supply is constrained and lending fees are large. Lamont and Thaler (2003) analyze a sample of U.S. tech stocks carve-outs and conclude that shorting costs are extremely high for these stocks, deterring arbitrage. Substantial short-sales restrictions for internet stocks are documented by Ofek and Richardson (2003). The evidence presented by Bris, Goetzmann, and Zhu (2003) indicates that short-sales restrictions may be substantial in international equity markets. In many countries, legal and institutional obstacles prevent an active market for borrowing stocks. Chen *et al.* (2002) formalize the analysis of Miller and show that the prediction that optimists are the marginal investors when expectations are heterogeneous also holds when some, not all, investors are constrained in shorting the stock. Even without considering shorting costs,

[51] Scheinkman and Xiong (2003) show that heterogeneous beliefs about fundamental values arise when different investors put more emphasis on specific signals.

this assumption is realistic, because many institutional investors are prohibited to take short positions. In addition, other market frictions may impede short selling.[52]

The aim of this chapter is to test Miller's prediction that in the presence of short-sales restrictions, optimistic investors are the marginal investors.[53] The implication is that the greater the divergence in the valuations of optimistic and the pessimistic investors, the higher the stock price in equilibrium, and consequently the lower the subsequent returns. The dispersion of analyst forecasts can be viewed as a measure for the divergence of investor opinions. Our main hypothesis is thus that there is a negative relation between the forecast dispersion and future stock returns. Note that this theory does not necessarily require non-rational behavior, as investors may receive different information signals or draw different inferences from common signals. Furthermore, the existence of short sales constraints is also not a necessary condition, as other market frictions may prevent the revelation of pessimistic opinions.

Following Diether *et al.* (2002), we confront our main hypothesis with two distinct alternative hypotheses. The first is that differences in opinion do not affect asset prices. Diamond and Verrecchia (1987) develop a market microstructure model with asymmetrically informed traders. In their setting, introducing short-selling constraints does not lead to an upward bias in the prices, because the price-setting market maker takes into account that the information content of observed transactions is changed. The model of Diamond and Verrecchia predicts a flat relationship between forecast dispersion and returns. The second alternative hypothesis is based on the view that high forecast dispersion is associated with high uncertainty in earnings. That is, divergence of opinions among analysts is caused by uncertainty about the future earnings of the company. This means that forecast dispersion is an ex-ante risk measure. Even if this risk is idiosyncratic, investors that are not fully diversified will demand a risk premium. The resulting prediction is that there is a positive relation between analyst dispersion and subsequent returns.

5.3 Data and methodology

We analyze the relationship between the differences in analysts' opinions and stock returns in four European capital markets – France, Germany, the Netherlands, and the United Kingdom. We select these four markets for two reasons. First, they represent the major European markets, and secondly, the large number of stocks listed there in each period

[52] An interesting illustration is provided by Ofek and Richardson (2003), who argue that lock-up agreements are a severe form of short-sales constraints for a signification fraction of the shareholders.

[53] Interestingly, the two key elements of Miller's theory – divergence of opinions and short-sales constraints – may reinforce each other, as D'Avolio (2002) finds evidence in favor of his hypothesis that the likelihood of a stock being special (*i.e.* high lending fees) increases in differences of opinion between non-lenders and short-sellers.

allows us to construct sufficiently large portfolios. We closely follow the methodology of Diether *et al.* (2002) to facilitate comparison with the U.S. results. We measure the difference in opinions by the dispersion in analyst earnings forecasts. This is defined as a ratio of the standard deviation of analyst earnings per share forecasts for the current fiscal year-end to the absolute value of the mean forecast. Earnings estimates are obtained from the Institutional Brokers Estimate System (I/B/E/S). Stock returns and market capitalizations are taken from Datastream. Worldscope provides book values of equity.

It is a policy of I/B/E/S to report all forecasts and their summary statistics adjusted for stock splits such that historical data appears on the same basis as current data. This adjustment is convenient for the reporting of smoothed earnings time series. However, the adjusted figures are rounded and reported with no more than two decimal places. Such a correction can lead to the underestimation of the standard deviation of forecasts as discussed by Diether *et al.* (2002). This would create a spurious relationship between our dispersion measure and subsequent stock returns. In that case, we would observe that stocks with low dispersion also have higher future returns compared to stocks with high dispersion. After a careful scrutiny of the data we conclude that the adjustment-rounding problem is an issue in the I/B/E/S *summary history* files containing summary statistics of analyst forecasts by firm and period. *Detailed history* files with individual analyst-by-analyst earnings estimates do not suffer from this problem. The analyst forecasts that were adjusted (by I/B/E/S for stock splits) have up to four decimal places. The forecasts for firms without any stock split have two decimal places. Therefore we conclude that using *detailed history* files we can "unadjust" the adjusted analyst-level forecasts and recalculate the summary statistics, such as means and standard deviations, which we require for our analysis.

This reconstruction also helps us to circumvent the possibility that the summary statistics include "old" analyst estimates. For each forecast the detailed history files report among others its estimate date and review date. The review date is the last date when the analyst has confirmed that the forecast is still valid. Comparing the individual forecasts and their summary statistics, we find evidence that summary statistics occasionally contain forecasts that are no longer current. Diether *et al.* (2002) also report this flaw of I/B/E/S summary history files.

We begin by matching the individual analyst forecasts with the appropriate adjustment factor contained in the *adjustments file*. By multiplying the forecasts estimated on a certain day with the cumulative adjustment factor valid for the given firm and period, we obtain an earnings estimate based on the historical number of shares. Next, the unadjusted forecasts are converted into local currency with the help of *exchange rate file* rates. The following step is to sort all firms' unadjusted analyst-level forecasts by the broker firm identifier, estimate date, and review date in order to determine which forecasts should be included in the monthly summary statistics. While it would be desirable to sort

by analysts instead of broker firms, the identity of the analyst is not always known. However, it is unlikely that multiple analysts in the same broker firm follow the same company in the same period.

The monthly summary statistics are always calculated as of the Thursday before the third Friday of each month in order to comply with the I/B/E/S methodology. Each analyst's earnings forecast must satisfy three conditions to be included in the monthly summary. First, it has to be estimated before this Thursday (an estimated date condition). Second, if the review date lies before this Thursday of the previous month, the forecast is considered no longer valid in the current month (a review date condition). Finally, if an analyst released multiple forecasts in the month between the two Thursdays, only the most recent one is considered. Besides the firm and period identifier our summary file also contains the smallest and the largest estimate, mean and median forecast, their standard deviation, and the number of forecasts.

We analyze the relationship between the differences in analysts' opinions and stock returns in the period between January 1992 and July 2003. Although I/B/E/S reports analyst forecasts for European stocks already from 1987, the coverage during the first five years is limited. The advantage of our eleven and half year period is that it includes various market conditions. First, we observe a "normal" period from 1992 till approximately 1997 characterized by steady market growth and relatively low volatility of stock returns. Second, we capture the bubble build-up period at the end of the 1990s, which culminates in markets crashing in 2000. This was followed by a three-year period of market prices returning to the levels they had in the mid of 1990s. Finally, we capture a small portion of the market recovery starting around March 2003.

The size of our sample varies per country, and it depends both on the number stocks listed there and their coverage by analysts.[54] The largest sample is not surprisingly the U.K. Over the complete 139-month period, we collect a total number of 101,872 firm-month observations for dispersion (for 1,571 firms). On average this represents dispersion in analysts' forecasts for 733 stocks each month. For the Netherlands we have the smallest sample with 19,544 forecast dispersions for 223 firms. The average number of monthly dispersion observations is 141. We have 30,930 forecast dispersions for 577 German stocks, and finally, 41,091 dispersions for 657 French stocks. Most stocks in our sample are present for a long period of time. In the Netherlands, stocks are contained in our sample for on average 88 months, and in Germany the time period is shortest with on average 53 months of (not necessarily consecutive) forecast dispersions. A difficulty arises in case of stocks with zero mean earnings per share forecast, as the dispersion measure cannot be calculated. Following Diether *et al.* (2002), we do not eliminate those observations, but give them a special code and in the following analysis we assign them to

[54] Our measure of dispersion in analysts' earnings forecasts requires by definition at least two valid forecasts by two different analysts in each month.

the portfolio with the highest dispersion. We also perform robustness checks by excluding observations with zero mean earnings forecasts.

5.4 Dispersion and stock returns

In this section we analyze the relationship between the differences in analysts' opinions and stock returns. The relationship is investigated for each country separately. The reason is that due to institutional or other country-specific differences the effect of dispersion on stock returns may vary across the four countries. If we find that the relationship is homogeneous across the four samples, the power of the tests for the combined sample would be higher. However, constructing a pan-European sample in case of heterogeneous relationships would mitigate the possibility to observe this heterogeneity, and the results would be to a large extent driven by the U.K. sample.

We allocate stocks to various portfolios based on their dispersion, and measure the subsequent returns for different portfolio holding periods. Further, we assign stocks into groups based on one other risk factor, besides dispersion, such as size, book-to-market, and momentum. This procedure is aimed to find out whether the differences in returns between low and high dispersion stocks can be attributed to one or more of these risk factors.

5.4.1 Sorting by dispersion

We begin by allocating the stocks at the beginning of each month into five portfolios based on their dispersions as of the Thursday before the third Friday of the previous month. The reason for this is that all market participants can then be expected to know the dispersion. We hold the stocks for the following T months, where T equals one, six, and twelve months. Each month $1/T$th of the portfolios is reinvested. We require a stock to have returns for the complete holding period in order to be included in the analysis. This procedure is repeated every month in the period between January 1992 and July 2003. The portfolio returns are equally weighted. In Table 5.1 we present the mean monthly portfolio returns by quintiles of dispersion in analysts' earning forecasts over the three holding periods, for the four countries.

Table 5.1: Mean portfolio returns by dispersion in analyst forecasts

This table reports monthly mean portfolio returns by dispersion in analyst forecasts and portfolio holding period. At the beginning of each month stocks are sorted into five groups based on the dispersion in analyst forecasts. Dispersion in analyst earnings forecasts is measured on the third Thursday of the previous month. It is defined as the ratio of the standard deviation of analysts' current-fiscal-year annual earnings per share forecasts (unadjusted for stock splits) to the absolute value of the mean forecast. Stocks with a mean forecast of zero are assigned to the highest dispersion group. The stocks are held for *T* months (*T*=1, 6, or 12), with 1/*T*th of each portfolio reinvested monthly. Portfolio returns are equal-weighted. The sample period is January 1992 till July 2003. The symbol '***' denotes that the estimated coefficient is significant at the 1% level; '**' at the 5% level; '*' at the 10% level.

	Mean Returns in %					
	Holding period in months					
	1	6	12	1	6	12
	Panel A: Germany			*Panel B: France*		
D1 (low dispersion)	0.32	-0.25	-0.01	1.16	0.88	1.19
D2	0.29	-0.05	0.35	0.99	0.68	1.14
D3	0.17	-0.30	0.17	0.78	0.85	1.20
D4	-0.12	-0.75	-0.45	1.51	0.76	1.21
D5 (high dispersion)	-0.85	-1.10	-0.55	0.52	0.11	0.54
D1-D5	1.18***	0.86***	0.54*	0.65	0.77*	0.65**
t-statistic	3.11	2.62	1.75	1.47	1.97	2.30
	Panel C: the Netherlands			*Panel D: U.K.*		
D1 (low dispersion)	0.97	0.78	1.13	1.00	0.65	1.08
D2	1.11	0.84	1.14	0.93	0.60	1.05
D3	0.76	0.50	1.02	0.92	0.62	1.12
D4	0.54	0.10	0.77	0.81	0.53	1.09
D5 (high dispersion)	0.56	-0.22	0.48	0.90	0.55	1.25
D1-D5	0.40	0.99**	0.65*	0.10	0.09	-0.17
t-statistic	0.70	2.36	1.67	0.33	0.32	-0.67

The overall results in Table 5.1 suggest that stocks with high dispersion of analyst forecasts have lower returns than low dispersion stocks. The negative relationship between forecast dispersion and future stock returns is consistent with Miller (1977). A hypothesis that the dispersion of analyst earnings forecasts proxies for systematic risk is not supported. Further, we observe that in Germany high dispersion stocks perform worse than low dispersion stocks already during the first month after the formation of the portfolios. The difference in monthly returns between the low and high dispersion portfolios (D1-D5) is 118 basis points, which is significant at the 1 percent level. In France and the Netherlands the mean returns on the high dispersion stock portfolios are lower compared to

mean returns of low dispersion portfolios. However, the significant underperformance of high dispersion stocks does not occur during the first month after the formation of the portfolios, but later. The results for longer holding periods suggest that there is no need for frequent rebalancing of portfolios as the positive difference in the returns persists even for portfolios that are held for twelve months. The returns of the U.K. stocks suggest that there is no relationship between the differences in opinions and returns.

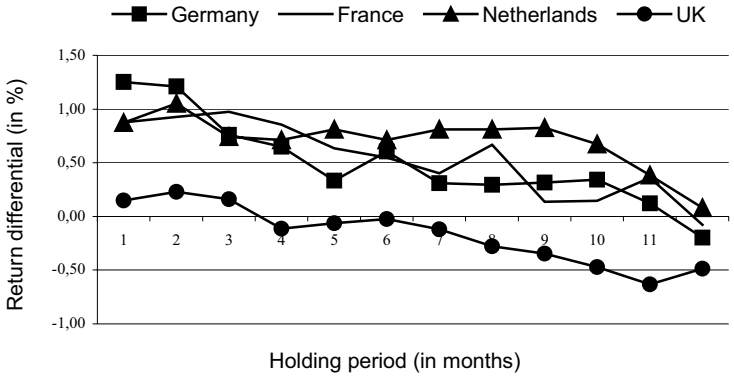
In order to assess whether the dispersion effect is persistent, we examine the spread between low and high dispersion portfolios in the twelve months following the sorting into the portfolios. Figure 5.1 illustrates the behavior of monthly returns for a longer holding period. At the beginning of each month we allocate stocks to five portfolios based on their dispersion in the previous month and hold them for twelve months. Next, we calculate for each portfolio the average return for each month of the holding period. Figure 5.1 plots the spread in these return averages between the lowest and highest dispersion portfolios.

Figure 5.1 shows that the monthly return differentials in all four countries follow very similar patterns. They are highest during the first three months of the holding period. For Germany, France, and the Netherlands these spreads are close to 100 basis points per month in the first three months. During the following months the return differentials decrease. Nevertheless, it is worth noticing that in Germany, France, and the Netherlands even after the six months of holding the portfolios, they are still close to 50 basis points per month. Towards the end of the horizon, the return spreads are reduced to approximately zero. The monthly patterns for France and the Netherlands explain why their mean monthly return differences reported in Table 5.1 are higher for the six months holding strategy than the one or twelve month periods.

Table 5.1 indicates that the relationship between the dispersion and the portfolio returns is non-monotonic. Most of the positive differences between low and high dispersion stocks can be attributed to the underperformance of high dispersion stocks compared to median dispersion stocks than the outperformance of low versus median dispersion stocks. For example, in Germany the return differential between low and high dispersion stocks is 118 basis points for one month holding period. The underperformance of high dispersion stocks compared to median dispersion stocks is equal to 102 basis points, while there is only 15 basis points outperformance of low versus median dispersion stocks.

Figure 5.1: Monthly return differentials

This figure plots a difference in average monthly returns between low dispersion and high dispersion portfolios for a twelve-month holding period. The portfolios are formed as in Table 5.1.



The decreasing monthly return spreads observed in Figure 5.1 could then be attributed to the decrease in the forecast dispersion of high dispersion stocks over the holding period, and thus also lower returns for these stocks. In order to find out whether the decrease of the spread in Figure 5.1 is not just related to the decrease in dispersion, Table 5.2 reports mean forecast dispersions for portfolios described in Table 5.1. Each month *t+1* we allocate stocks into five portfolios based on their dispersion in analyst earnings forecasts on the Thursday before the third Friday of the previous months (*t*). This mean dispersion per quintile of dispersion is reported in columns depicting the one-month horizon in Table 5.2. For portfolios that have longer holding periods than one month, we take the stocks contained in those portfolios and average their dispersion as of the Thursday before the third Friday of the last but one month of the holding period. For example, stocks that are held three months (*t+1* till *t+3*) are assigned into portfolios in month *t+1* based on dispersion in month *t*, and the dispersion reported in Table 5.2 is measured in month *t+2*. The mean dispersions in Table 5.2 provide answer to the question how dispersion in analyst earnings forecasts develops over time.

Table 5.2: Mean portfolio dispersions

This table shows mean dispersion in analyst forecasts by the quintile portfolio and holding period. At the beginning of each month stocks are sorted into five groups based on the dispersion in analyst forecasts. Dispersion in analyst earnings forecasts is measured on the third Thursday of the previous month. It is defined as the ratio of the standard deviation of analysts' current-fiscal-year annual earnings per share forecasts (unadjusted for stock splits) to the absolute value of the mean forecast. Stocks are held for one, six, or twelve months. For longer holding periods than one month, the dispersion is measured on the third Thursday before the last month of the holding portfolio period. The sample period is January 1992 till July 2003. The symbol '***' denotes that the estimated coefficient is significant at the 1% level; '**' at the 5% level; '*' at the 10% level.

	Mean Dispersion per portfolio					
	Portfolio holding period in months					
	1	6	12	1	6	12
	Panel A: Germany			*Panel B: France*		
D1 (low dispersion)	0.05	0.17	0.24	0.05	0.14	0.27
D2	0.11	0.25	0.35	0.10	0.24	0.30
D3	0.21	0.41	1.85	0.17	0.31	0.52
D4	0.49	1.91	1.07	0.32	1.04	1.52
D5 (high dispersion)	4.07	2.43	2.04	4.95	4.12	3.77
D1-D5	-4.02***	-2.26***	-1.80***	-4.90***	-3.98***	-3.51***
t-statistic	-4.35	-12.34	-11.65	-5.13	-4.03	-3.14
	Panel C: the Netherlands			*Panel D: U.K.*		
D1 (low dispersion)	0.03	0.09	0.15	0.02	0.09	0.11
D2	0.07	0.12	0.19	0.05	0.19	0.13
D3	0.12	0.23	0.63	0.08	0.14	0.17
D4	0.25	1.87	1.88	0.15	0.22	0.50
D5 (high dispersion)	3.72	1.74	1.44	1.97	1.81	1.59
D1-D5	-3.69***	-1.65***	-1.29***	-1.95***	-1.73***	-1.48***
t-statistic	-3.17	-11.77	-10.53	-9.74	-7.99	-6.85

Table 5.2 reveals three distinct patterns in the mean dispersions of analyst earnings forecasts, which are consistent over the four countries. First, there is a remarkable persistence in the reported mean dispersions. The stocks that were allocated to the highest dispersion quintile continue to have high dispersion. Similarly, stocks in the lowest dispersion quintile maintain their low dispersion. Even after twelve months the difference in dispersions of low versus high quintiles is statistically significant at the 1 percent level. Unreported results show that this trend continues for the period of at least two years after the portfolio formation. The second pattern observed in Table 5.2 is a slow mean reversion in portfolio dispersions. The dispersion of stocks in the lowest quintile gradually increases over the twelve-month period. Equally, the dispersion of stocks in the highest quintile

exhibits a slow decrease. Third, the evidence indicates that the stocks in the highest quintile group are very different from the rest. While the mean dispersion is slowly increasing over the first four quintiles, the means in the highest dispersion quintile are dramatically higher, especially in the month that serves as a basis for allocating stocks into the portfolios (see the columns for one-month horizon). In order to check whether the stocks with the mean forecast close to zero (and therefore a very high ratio of the standard deviation of forecasts to the absolute value of the mean forecast) do not drive the results in D5, we have also calculated median dispersions per portfolio and holding period. Unreported results show that medians are relatively close to the reported means, and exhibit similar patterns.

So far, in this section, we have investigated the patterns in dispersion of forecasts and the returns of portfolios based on dispersion. The following section examines the total risk related to these portfolio returns. We complement the dispersion-return analysis by investigating the volatility of the returns depicted in Table 5.1. Table 5.3 reports the standard deviations of the time-series of monthly portfolio returns by dispersion quintile and the portfolio holding period. We also present the results of an *F*-test for equal variances of the low and high dispersion portfolios.

The reported standard deviations show that the volatility of the high dispersion portfolios is always significantly higher than the volatility of the low dispersion portfolio returns. This effect is present in all countries and for all holding periods. This signifies that, except for the U.K., the high returns of the low dispersion stocks face the lower volatility than the low returns of the high dispersion stocks. The observation that dispersion is positively related to the standard deviation of returns, and negatively related to future returns is consistent with the findings of Diether *et al.* (2002) for the U.S.

Table 5.3: Volatility of portfolio returns

This table shows the volatility of portfolio returns by forecast dispersion and holding period. At the beginning of each month stocks are sorted into five groups based on the dispersion in analyst forecasts. Dispersion in analyst earnings forecasts is measured on the third Thursday of the previous month. It is defined as the ratio of the standard deviation of analysts' current-fiscal-year annual earnings per share forecasts (unadjusted for stock splits) to the absolute value of the mean forecast. Stocks with a mean forecast of zero are assigned to the highest dispersion group. The stocks are held for T months (T=1, 6, or 12), with 1/Tth of each portfolio reinvested monthly. Portfolio returns are equal-weighted. Volatility of portfolio returns is measured as the standard deviation of the time-series of portfolio returns. The F-statistic is reported for the test of equal variances for the low and high dispersion portfolios. The sample period is January 1992 till July 2003. The symbol '***' denotes that the estimated coefficient is significant at the 1% level; '**' at the 5% level; '*' at the 10% level.

	Volatility of Portfolio Returns					
	Portfolio holding period in months					
	1	6	12	1	6	12
	Panel A: Germany			*Panel B: France*		
D1 (low dispersion)	5.46	5.02	4.61	4.89	5.06	4.98
D2	5.65	5.36	4.76	5.65	5.61	5.30
D3	5.81	5.49	4.88	5.85	6.97	6.25
D4	7.42	6.85	5.73	9.89	7.80	7.65
D5 (high dispersion)	8.25	7.60	6.74	8.33	7.80	6.56
D1-D5	-2.79***	-2.59***	-2.13***	-3.44***	-2.73***	-1.58***
F-statistic	2.29	2.30	2.13	2.90	2.37	1.73
	Panel C: the Netherlands			*Panel D: U.K.*		
D1 (low dispersion)	4.24	3.98	3.78	5.02	4.82	4.49
D2	4.83	4.51	4.10	4.99	4.83	4.51
D3	5.29	5.06	4.43	5.38	5.12	4.72
D4	5.81	5.71	5.09	5.81	5.51	5.05
D5 (high dispersion)	8.77	7.03	6.17	7.37	6.98	6.34
D1-D5	-4.53***	-3.05***	-2.39***	-2.36***	-2.16***	-1.85***
F-statistic	4.28	3.12	2.67	2.16	2.10	1.99

5.4.2 Sorting by dispersion, size, book-to-market, and momentum

In order to investigate whether the relationship between dispersion and returns can be attributed to a size, book-to-market, or momentum effect, we expand the way we sort our stocks into portfolios. Fama and French (1993) demonstrate that factors related to market capitalization and the book-to-market value of equity explain a substantial part of the cross-sectional variation in stock returns. Jegadeesh and Titman (1993) show the persistence of past three to twelve month returns, also known as the momentum effect.

Table 5.4 presents multivariate sorts for each country and all three holding periods. We sort stocks into groups on the basis of the sample median. The lack of data does not permit us to base the two-way sorts on the quintile values as in Table 5.1. We start by depicting a two-way grouping by size and dispersion. At the beginning of each month stocks are allocated into two size groups based on their market capitalization at the end of the previous month. Subsequently, stocks in each size group are sorted into two dispersion classes based on the dispersion in the previous month. We also present results of a two-way sorting routine by book-to-market (B/M) ratio and dispersion. The B/M ratio is defined as the ratio of a firm's book value of equity (BE) to its market capitalization. For stocks allocated to portfolios between July and December of year *y*, BE is the figure reported at the end of fiscal year *y-1*. For stocks assigned to portfolios between January and June of year *y*, BE is the figure related to fiscal year *y-2*. This book value of equity is then divided by the market capitalization measure at the end of the previous month. The B/M ratio is thus updated each month. This method is identical to the sorting methodology of Diether *et al.* (2002). The final two-way sort is by momentum and dispersion. The momentum of a stock in month *t* is defined as the return over the period from *t-12* to *t-2* following Carhart (1997). This procedure is repeated for each of the four countries. In case of the six and twelve month holding period $1/6^{th}$, respectively $1/12^{th}$, of each portfolio is reinvested each month (as in Table 5.1). The portfolio mean monthly returns, their differences and *t*-statistics are presented in Table 5.4.

The results for German stocks in Table 5.4 demonstrate that size, book-to-market, and momentum effects do not explain the underperformance of high dispersion stocks. The differences in returns between low and high dispersion portfolios are always positive and consistent over the three holding periods. The size of the dispersion effect ranges from 46 to 63 basis points (significant at the 1 percent level) for large German stocks. The average monthly return spread among small cap stocks reaches 56 basis points for the six-month holding period. For one and twelve month holding period, it is positive though not statistically significant. The sorting on book-to-market shows a very high dispersion effect of 78 to 88 basis points among low book-to-market stocks. This result is significant at the 1 percent level in all three holding periods. It is also worth noticing that this effect is almost twice the size the return differentials for high book-to-market stocks.

Table 5.4: Mean portfolio returns by Size, Book-to-Market, Momentum and Dispersion

At the beginning of each month stocks are sorted into two groups based on the level of market capitalization at the end of the previous month. Each group is then sorted into two dispersion groups. Dispersion in analyst earnings forecasts is measured on the third Thursday of the previous month. It is defined as the ratio of the standard deviation of analysts' current-fiscal-year annual earnings per share forecasts (unadjusted for stock splits) to the absolute value of the mean forecast. Stocks with a mean forecast of zero are assigned to the highest dispersion group. Stocks are also sorted at the beginning of each month into two groups based on their book-to-market ratio (momentum). Each group is then sorted into two dispersion groups as described above. The book-to-market ratio is defined as a ratio of a firm's book value of equity (BE) to its market capitalization. For stocks allocated to portfolios between July and December of year *y*, BE is the figure reported at the end of fiscal year *y-1*. For stocks allocated to portfolios between January and June of year *y*, BE is the figure reported at the end of fiscal year *y-2*. This BE figure is then divided by the market capitalization measured at the end of the previous month. Momentum, for stocks allocated to portfolios in month *t*, is measured as a return over a period *t-2* till *t-12* months. The stocks are held for *T* months (*T*=1, 6, or 12), with 1/*T*th of each portfolio reinvested monthly. Portfolio returns are equal-weighted. The sample period is January 1992 till July 2003. The symbol '***' denotes that the estimated coefficient is significant at the 1% level; '**' at the 5% level; '*' at the 10% level.

Mean returns in %								
	Germany		France		Netherlands		U.K.	
Panel A: one-month holding period								
Dispersion	Small Cap	Large Cap	Small Cap	Large Cap	Small Cap	Large Cap	Small Cap	Large Cap
Low	-0.32	0.76	1.00	1.02	1.02	0.99	0.97	0.95
High	-0.74	0.13	1.04	0.88	0.30	0.82	0.81	0.91
Low-high	0.42	0.63***	-0.04	0.14	0.73*	0.17	0.17	0.04
t-statistic	1.28	2.71	-0.07	0.63	1.74	0.61	0.77	0.19
	Low B/M	High B/M	Low B/M	High B/M	Low B/M	High B/M	Low B/M	High B/M
Low	0.21	0.36	0.84	1.10	0.84	1.14	0.70	1.25
High	-0.67	-0.04	0.68	1.01	0.44	0.74	0.65	1.07
Low-high	0.88***	0.39	0.16	0.09	0.41*	0.40	0.05	0.18
t-statistic	3.59	1.47	0.63	0.28	1.87	0.85	0.24	0.84
	Loser	Winner	Loser	Winner	Loser	Winner	Loser	Winner
Low	-0.51	0.82	0.46	1.40	0.36	1.30	0.55	1.28
High	-0.80	0.31	0.83	1.29	0.31	1.13	0.48	1.41
Low-high	0.28	0.50**	-0.37	0.10	0.05	0.17	0.07	-0.13
t-statistic	0.92	2.39	-0.65	0.62	0.11	0.79	0.31	-1.07

Table 5.4: Mean portfolio returns by Size, Book-to-Market, Momentum and Dispersion (continued)

	Mean returns in %							
	Germany		France		Netherlands		U.K.	
Panel B: six-month holding period								
Dispersion	Small Cap	Large Cap	Small Cap	Large Cap	Small Cap	Large Cap	Small Cap	Large Cap
Low	-0.75	0.26	0.60	0.87	0.68	0.87	0.62	0.65
High	-1.31	-0.19	0.55	0.58	-0.38	0.40	0.57	0.52
Low-high	0.56**	0.46**	0.04	0.29	1.07***	0.47*	0.04	0.13
t-statistic	2.00	2.42	0.08	1.49	4.20	1.71	0.24	0.69
	Low B/M	High B/M	Low B/M	High B/M	Low B/M	High B/M	Low B/M	High B/M
Low	-0.20	-0.13	0.62	0.79	0.60	0.97	0.38	0.92
High	-0.99	-0.57	0.32	0.54	0.15	-0.09	0.35	0.73
Low-high	0.79***	0.44*	0.30	0.25	0.45*	1.07***	0.03	0.19
t-statistic	3.82	1.96	1.35	0.88	1.94	3.35	0.14	1.04
	Loser	Winner	Loser	Winner	Loser	Winner	Loser	Winner
Low	-0.84	0.42	0.29	1.05	0.23	1.10	0.24	0.87
High	-1.20	-0.10	0.50	0.84	-0.43	0.71	0.28	1.02
Low-high	0.36	0.52***	-0.20	0.21	0.66**	0.39**	-0.04	-0.15
t-statistic	1.42	3.00	-0.35	1.55	2.40	2.13	-0.21	-1.19
Panel C: twelve-month holding period								
Dispersion	Small Cap	Large Cap	Small Cap	Large Cap	Small Cap	Large Cap	Small Cap	Large Cap
Low	-0.35	0.58	1.05	1.20	1.12	1.15	1.13	1.05
High	-0.75	0.11	1.08	0.88	0.45	0.90	1.29	1.01
Low-high	0.40	0.47***	-0.03	0.31*	0.68***	0.26	-0.15	0.03
t-statistic	1.59	2.75	-0.04	1.93	2.68	1.08	-0.94	0.18
	Low B/M	High B/M	Low B/M	High B/M	Low B/M	High B/M	Low B/M	High B/M
Low	0.05	0.36	0.93	1.31	0.95	1.30	0.81	1.39
High	-0.74	-0.03	0.68	0.92	0.70	0.75	0.86	1.42
Low-high	0.78***	0.39*	0.25	0.39*	0.25	0.55*	-0.04	-0.04
t-statistic	4.32	1.91	1.26	1.70	1.19	1.85	-0.21	-0.24
	Loser	Winner	Loser	Winner	Loser	Winner	Loser	Winner
Low	-0.25	0.63	1.07	0.98	0.88	1.30	0.94	1.15
High	-0.57	0.11	0.95	1.07	0.43	1.03	1.13	1.30
Low-high	0.32	0.52***	0.12	-0.09	0.45	0.27	-0.19	-0.15
t-statistic	1.34	3.42	0.34	-0.18	1.56	1.61	-1.07	-1.20

For France, the results of sorting by size, book-to-market, and momentum suggest that these factors capture most of the dispersion effect. The differences in returns between low and high dispersion portfolios are often positive, but very small, and in five cases negative, though close to zero. The six-month holding period sorts produce return spreads between 21 and 30 basis points for large, low book-to-market, and winner stocks, but these figures are not statistically significant at standard levels. Panel C shows dispersion effect in the magnitude of 31 to 39 basis points (at 10 percent significance level) for large and high book-to-market stocks.

The patterns we find for Dutch stocks resemble the German results. The return spreads are not absorbed by any of the three factors. The differences in returns between low and high dispersion stocks are in all periods positive and in several cases very high. Sorts by size reveal return differentials between 47 basis points for large stocks to an astonishing 107 basis points for small stocks in Panel B. The dispersion effect among small stocks is, besides being economically important, also statistically significant across the three holding periods. It is up to two or three times larger than the dispersion effect for large stocks. Next, the sorting on book-to-market produces large monthly return spreads in the range of 41 to 107 basis points. The spreads in the lower part of the range are not significantly different from zero. We find that the dispersion effect is at least twice as large for high book-to-market stocks than low book-to-market stocks for holding periods longer than one month. Finally, controlling for the momentum effect leaves monthly return differentials between low and high dispersion stocks of 27 to 66 basis points. These effects are mainly present in the longer holding periods, though they are not statistically significant for the twelve-month horizon.

Finally, there are no signs of a dispersion effect for U.K. stocks. The monthly return spreads are all close to zero and none of them is statistically significant at standard significance levels. Together with the results presented in Table 5.1, it seems that the U.K. sample behaves very differently from the continental European sample.

5.4.3 Multifactor time-series analysis

In this section we investigate whether a multifactor asset pricing model can capture the return patterns observed in Table 5.1. For this purpose we estimate a four-factor model. The model is based on the Fama and French (1993) three-factor model that includes the excess market return and the return on portfolios that mimic risk factors related to size and book-to-market. Carhart (1997) extends the model by a fourth factor that captures the momentum effect first described by Jegadeesh and Titman (1993). We estimate the following model:

$$R_{it} - R_{ft} = a_i + b_{iM}\left(R_{Mt} - R_{ft}\right) + s_i SMB_t + h_i HML_t + m_i UMD_t + e_t \qquad (1)$$

In this model R_{it}–R_{ft} is the monthly return on a dispersion quintile portfolio as defined in Table 5.1 in excess of the risk free rate. We measure the excess market return R_{Mt}–R_{ft} by the return on MSCI Europe index (including also the U.K.) over the country specific one-month interbank rate. The size factor *SMB* and the six-month momentum factor *UMD* are obtained from UBS Warburg style indices for Europe (including the U.K.). Although Carhart (19997) relates the UMD factor to the past eleven-month returns, we believe that the UBS six-month momentum factor provides a reasonable approximation of the momentum effect, as it is well known that the effect is strongest in the first six months. Finally, we proxy the difference in returns between high and low book-to-market stock portfolios (*HML*) by the difference in returns on the MSCI Europe Value and Growth indices.[55] The slope coefficients in regression (1) can be interpreted as the portfolio's sensitivities to priced risk factors. If part of the returns cannot be explained by the four risk factors, the intercept in the regression will differ from zero. In addition to explaining the excess returns of the low and high dispersion portfolios, we also regress the difference of the two returns R_{D1t}–R_{D5t} on the four factors. Tables 5.5a, b, and c present the results for the three different holding periods.

The estimated factor sensitivities give a qualitatively very similar picture for the four countries and the three holding periods. Low dispersion stocks have lower market risk compared to high dispersion stocks (with average betas of less than one). Further, they resemble large stocks and past winners (low loading on *SMB*, and high loading on *UMD*). For the Netherlands and to a lesser extent for France, there is some evidence that these stocks load more heavily on the *HML* factor. High dispersion stocks, on the other hand, behave more like small stocks with higher market risk and lower sensitivity to the *HML* factor. The four-factor model explains a large part of the time-series variation in the portfolio excess returns. The adjusted R^2s lie between 51 and 73 percent.

[55] As a robustness check, we compare our HML factor with the returns on the European (including U.K.) index portfolios formed on B/M obtained from K. French (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/). This factor is available for the period between January 1975 and December 2001. The correlation coefficient between the two factors equals 0.73 suggesting that our HML factor calculated on the basis of MSCI indices provides a good approximation.

Table 5.5a: The four-factor model for one-month portfolio returns

This table reports estimates of the four-factor model *(1)*, for monthly returns on a zero-investment strategy that buys a portfolio of stocks with low dispersion and shorts a portfolio of stocks with high dispersion. Further, the four-factor model is also estimated for monthly excess returns on the low and high dispersion portfolios. The market premium is the difference between the return on MSCI Europe index and a country one-month interbank interest rate. The size premium SMB, and the 6-month momentum premium UMD are obtained from the UBS style indices. The growth premium HML is the difference in returns on MSCI Europe Value and MSCI Europe Growth indices. The formation of portfolios is described in Table 5.1. The sample period is January 1992 till July 2003. The symbol '***' denotes that the estimated coefficient is significant at the 1% level; '**' at the 5% level; '*' at the 10% level. *t*-statistics (Newey-West adjusted) are in parentheses.

		Factor Coefficients				
Portfolio	Alpha (%)	$R_M - R_F$	SMB	HML	UMD	Adj. R^2 (%)
		Panel A: Germany				
D1 (low dispersion)	-0.08	0.87***	0.49***	-0.36**	-0.15*	65.44
	(-0.28)	(13.41)	(4.50)	(-2.28)	(-1.71)	
D5 (high dispersion)	-1.08**	1.11***	0.73***	-0.59**	-0.54***	62.11
	(-2.49)	(12.78)	(3.60)	(-2.61)	(-4.10)	
D1 – D5	1.00***	-0.24***	-0.24	0.23	0.40***	26.19
	(3.10)	(-3.98)	(-1.63)	(1.23)	(5.24)	
		Panel B: France				
D1 (low dispersion)	0.61**	0.87***	0.63***	-0.26**	0.17**	69.10
	(2.22)	(16.45)	(7.72)	(-2.02)	(2.42)	
D5 (high dispersion)	0.05	1.30***	0.95***	-0.46	-0.20	65.73
	(0.13)	(13.62)	(4.97)	(-1.50)	(-0.80)	
D1 – D5	0.56	-0.42***	-0.31*	0.20	0.37*	32.71
	(1.49)	(-5.13)	(-1.90)	(0.82)	(1.80)	
		Panel C: the Netherlands				
D1 (low dispersion)	0.31	0.71***	0.37***	0.17	0.20**	61.19
	(1.07)	(15.34)	(4.04)	(1.60)	(2.60)	
D5 (high dispersion)	0.21	1.24***	0.89***	-0.62***	-0.16	51.22
	(0.32)	(8.71)	(3.97)	(-3.38)	(-1.05)	
D1 – D5	0.10	-0.53***	-0.52**	0.79***	0.36**	24.57
	(0.17)	(-3.72)	(-2.58)	(4.25)	(2.36)	
		Panel D: U.K.				
D1 (low dispersion)	0.39	0.80***	0.79***	0.06	0.20***	64.44
	(1.55)	(14.81)	(8.78)	(0.46)	(3.77)	
D5 (high dispersion)	0.47	1.20***	1.27***	-0.22	0.09	72.32
	(1.24)	(11.48)	(8.44)	(-0.88)	(0.83)	
D1 – D5	-0.08	-0.40***	-0.48***	0.28	0.10	40.55
	(-0.29)	(-5.61)	(-4.18)	(1.58)	(1.06)	

Table 5.5b: The four-factor model for six-month portfolio returns

This table reports estimates of the four-factor model *(1)*, for monthly return differentials between stocks with low dispersion and stocks with high dispersion that are held for six months. Each month $1/6^{th}$ of each portfolio is reinvested. Further, the four-factor model is also estimated for monthly excess returns on the six-month low and high dispersion portfolios. The market premium is the difference between the return on MSCI Europe index and a country one-month interbank interest rate. The size premium SMB, and the six-month momentum premium UMD are obtained from the UBS style indices. The growth premium HML is the difference in returns on MSCI Europe Value and MSCI Europe Growth indices. The formation of portfolios is described in Table 5.1. The sample period is January 1992 till July 2003. The symbol '***' denotes that the estimated coefficient is significant at the 1% level; '**' at the 5% level; '*' at the 10% level. *t*-statistics (Newey-West adjusted) are in parentheses.

		Factor Coefficients				
Portfolio	Alpha (%)	$R_M - R_F$	SMB	HML	UMD	Adj. R^2 (%)
		Panel A: Germany				
D1 (low dispersion)	-0.43	0.80***	0.43***	-0.34**	-0.16*	65.44
	(-1.53)	(14.74)	(4.10)	(-2.20)	(-1.85)	
D5 (high dispersion)	-1.07**	1.05***	0.63***	-0.43*	-0.47***	61.14
	(-2.61)	(14.54)	(3.72)	(-1.95)	(-3.67)	
D1 – D5	0.64**	-0.25***	-0.19**	0.09	0.31***	29.64
	(2.31)	(-5.68)	(-2.15)	(0.68)	(4.58)	
		Panel B: France				
D1 (low dispersion)	0.54*	0.92***	0.63***	-0.29*	0.18**	70.14
	(1.84)	(15.52)	(7.36)	(-1.92)	(2.06)	
D5 (high dispersion)	0.06	1.23***	0.78***	-0.36	-0.28	67.72
	(0.14)	(13.06)	(4.90)	(-1.35)	(-1.17)	
D1 – D5	0.48	-0.32***	-0.15	0.07	0.45**	38.39
	(1.30)	(-4.76)	(-1.26)	(0.41)	(2.60)	
		Panel C: the Netherlands				
D1 (low dispersion)	0.27	0.70***	0.33***	0.20**	0.18***	66.44
	(0.95)	(18.36)	(4.90)	(2.18)	(3.07)	
D5 (high dispersion)	-0.29	1.08***	0.66***	-0.52***	-0.22	61.63
	(-0.61)	(14.34)	(3.83)	(-3.23)	(-1.44)	
D1 – D5	0.56	-0.38***	-0.33*	0.72***	0.40***	37.27
	(1.26)	(-5.28)	(-1.89)	(4.13)	(2.78)	
		Panel D: U.K.				
D1 (low dispersion)	0.27	0.78***	0.80***	0.04	0.19***	66.00
	(1.09)	(15.36)	(8.91)	(0.35)	(3.92)	
D5 (high dispersion)	0.43	1.15***	1.26***	-0.26	0.13	72.78
	(1.06)	(11.40)	(7.71)	(-1.06)	(1.23)	
D1 – D5	-0.15	-0.37***	-0.46***	0.30	0.07	42.49
	(-0.55)	(-5.54)	(-3.83)	(1.64)	(0.72)	

Table 5.5c: The four-factor model for twelve-month portfolio returns

This table reports estimates of the four-factor model *(1)* for monthly return differentials between stocks with low dispersion and stocks with high dispersion that are held for twelve months. Each month $1/12^{th}$ of each portfolio is reinvested. Further, the four-factor model is also estimated for monthly excess returns on the low and high dispersion portfolios. The market premium is the difference between the return on MSCI Europe index and a country one-month interbank interest rate. The size premium SMB, and the six-month momentum premium UMD are obtained from the UBS style indices. The growth premium HML is the difference in returns on MSCI Europe Value and MSCI Europe Growth indices. The formation of portfolios is described in Table 5.1. The sample period is January 1992 till July 2003. The symbol '***' denotes that the estimated coefficient is significant at the 1% level; '**' at the 5% level; '*' at the 10% level. *t*-statistics (Newey-West adjusted) are in parentheses.

		Factor Coefficients				
Portfolio	Alpha (%)	$R_M - R_F$	SMB	HML	UMD	Adj. R^2 (%)
		Panel A: Germany				
D1 (low dispersion)	-0.39	0.76***	0.50***	-0.32**	-0.10	62.47
	(-1.29)	(13.23)	(4.86)	(-2.34)	(-1.29)	
D5 (high dispersion)	-0.86**	0.98***	0.64***	-0.30	-0.34**	54.60
	(-2.02)	(12.05)	(4.27)	(-1.43)	(-2.57)	
D1 – D5	0.47	-0.22***	-0.14	-0.02	0.23***	18.21
	(1.55)	(-3.74)	(-1.51)	(-0.13)	(3.15)	
		Panel B: France				
D1 (low dispersion)	0.62**	0.92***	0.70***	-0.36**	0.22**	71.05
	(2.05)	(18.80)	(7.20)	(-2.38)	(2.43)	
D5 (high dispersion)	0.11	1.15***	0.99***	-0.56***	0.06	71.05
	(0.33)	(14.02)	(7.54)	(-2.95)	(0.47)	
D1 – D5	0.51*	-0.24***	-0.29***	0.20*	0.16**	23.51
	(1.70)	(-3.83)	(-2.78)	(1.68)	(2.11)	
		Panel C: the Netherlands				
D1 (low dispersion)	0.44	0.70***	0.39***	0.14	0.19***	68.03
	(1.61)	(20.35)	(5.32)	(1.49)	(2.68)	
D5 (high dispersion)	0.17	1.00***	0.82	-0.54***	-0.12	64.63
	(0.44)	(14.68)	(7.21)	(-3.29)	(-0.88)	
D1 – D5	0.28	-0.30***	-0.43***	0.68***	0.31**	34.64
	(0.71)	(-4.04)	(-3.04)	(3.76)	(2.21)	
		Panel D: U.K.				
D1 (low dispersion)	0.48*	0.74***	0.76***	-0.01	0.17***	63.62
	(1.94)	(14.26)	(7.88)	(-0.07)	(2.77)	
D5 (high dispersion)	0.81*	1.02***	1.22***	-0.34	0.16	67.95
	(1.94)	(12.02)	(6.86)	(-1.29)	(1.31)	
D1 – D5	-0.33	-0.29***	-0.47***	0.34*	0.01	37.50
	(-1.10)	(-5.98)	(-3.64)	(1.79)	(0.12)	

The results for the spreads in monthly returns between low and high dispersion portfolios provide evidence for a dispersion effect even after controlling for systematic risk. For all countries, except the U.K., and all holding periods, the alphas are positive with values between 10 and 100 basis points, although not all of them are significant at standard significance levels. The dispersion effect is strongest in the sample of German stocks. The outperformance (relative to the four-factor model) measured by the alphas ranges from 100 basis points in one-month holding period to 47 basis points for a twelve-month holding. This means that up to 85 percent of the difference between the returns on low and high dispersion stocks is unexplained. For the one-month holding period, 100 out of the return spread of 118 basis points and for the six-month period 64 out of 86 basis points are not accounted for by the model. The alphas of the four-factor model for French stocks have economically significant values between 48 and 51 basis points on a monthly basis. For the twelve-month holding period this result is significant at the 10 percent level. The results for the regression of Dutch spreads on the four factors indicate that most of the variation in the spreads can be attributed to the differences in sensitivities to the systematic risks of the two dispersion groups. The alphas are positive with values between 10 and 56 basis points, although they are not significant at standard significance levels. The alphas for the regression of the U.K. return spreads are negative and not significantly different from zero.

Table 5.3 indicated a strong positive relationship between forecast dispersion and volatility of the portfolio returns. This indicates that high dispersion stocks have significantly higher total risk than low dispersion stocks. The results presented in Table 5.5a till Table 5.5c suggest an opposite conclusion for the systematic risk. The correction for systematic risk is consistently higher for low dispersion stocks than for high dispersion stocks. This is clearly demonstrated by the fact that the average return spreads in Table 5.1 are higher than the alphas in Tables 5.5.

5.5 The stock market bubble and the dispersion effect

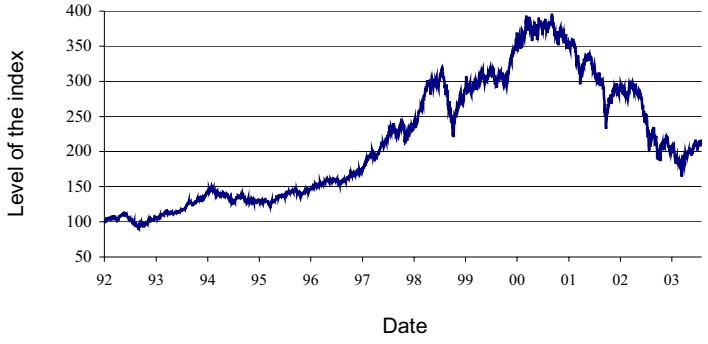
A recent paper by Hong and Stein (2003) develops a theory of market crashes that is based on the differences of opinions among investors. The authors argue that in the up-going markets short sale constraints prevent the disclosure of valuations of pessimistic investors. The accumulated hidden information is released during periods of market decline, as optimistic investors leave the market. In our investigation we conjecture that the more heterogeneous investors' opinions are, the higher the dispersion in earnings estimates. The higher dispersion of opinions also increases the likelihood of pessimistic stock evaluations. This implies that we should find most of the underperformance of the high dispersion stocks compared to low dispersion stocks concentrated in the periods of market decline.

In Table 5.6 we repeat the analysis presented in Table 5.1 for subsamples based on the stock market situation. During our sample period (January 1992 – July 2003) we

identify four different market situations – normal, bubble, down-market, and recovery period. The cut-off dates depend on the level of the MSCI Europe index.[56] See Figure 5.2 for the development of the MSCI Europe index over our sample period.

Figure 5.2: MSCI Europe index

This figure plots the development of the MSCI Europe index over our sample period. At 1 January 1992, we set the starting value to 100. The currency of the index is Euro.



The normal period runs from January 1992 till the beginning of the bubble period. As it is impossible to determine the first day of the bubble formation, we define the end of the normal period in two steps. First, we establish the lowest level of the index at the end of the down market period after year 2000. Second, we find the first month after January 1992 when the index reached this level. We classify this month as the end of the normal period. According to this definition, the normal period ends in September 1996. The bubble period runs from October 1996 till the end of the month when the index achieved its highest level, September 2000. The down-market period ends at the end of March 2003 when the index achieved its lowest level. The subsequent recovery period lasts for four months till the end of our sample period in July 2003. Due to the short duration of the recovery period in our sample, we exclude those observations from the analysis in this section.

The overall results in Table 5.6 suggest that the underperformance of high dispersion stocks compared to low dispersion stocks is concentrated in the period of market decline. The normal period and the bubble-build up period look very similar. In

[56] The results remain qualitatively unchanged if we use major local indices (DAX 30, CAC 40, AEX, and FTSE 100) instead of MSCI Europe index, and define the four subsamples for each country separately.

both periods, low dispersion stocks tend to have higher returns than high dispersion stocks for all countries (with the exception of the U.K.). During the normal period the positive return differentials are present mainly for the one and six month horizons. For Germany, France, and the Netherlands, we find that differences in returns between stocks with low and high dispersion vary between 31 and 71 basis points. The German spread of 71 basis points for the one-month holding period is statistically significant at the 5 percent level. In the bubble period, for Germany, France, and the Netherlands, low dispersion stocks have higher returns than high dispersion stocks, similar to the normal period. The effect ranges between 20 and 110 basis points, although not all are statistically significantly. A surprising result is that in the U.K. high dispersion stocks outperform low dispersion stocks in both normal and bubble periods. The effect is statistically significant at the 5 percent level for the twelve-month horizon.

The down market is expectedly characterized by negative average returns on all portfolios, in all holding periods and countries. However, the price decline is much larger for the high dispersion stocks than for low dispersion stocks. The monthly return spreads range between two to three hundred basis points. For France and the U.K., these spreads even increase over the holding horizons. The most interesting insight into the relationship between the dispersion in analyst earnings forecast and returns comes from the results for the U.K. The analysis in the previous sections suggested that for our sample of stocks listed in the U.K. the dispersion is not related to stock returns. The results in Table 5.6 indicate that forecast dispersion does affect stock returns, but the relationship is different in different time periods. The relationship between dispersion and returns is positive during the normal and bubble period. In the down market it is strongly negative with high dispersion stocks underperforming low dispersion stocks by around two hundred basis points a month. This evidence supports the theoretical model of Hong and Stein (2003) that the hidden information accumulated during the growing market is disclosed during the market decline. Finally, unreported results for the recovery period tentatively indicate outperformance of high-dispersion stocks in comparison with low dispersion stocks.

Table 5.6: Mean portfolio returns by dispersion in analyst forecasts and sub-period

This table reports mean portfolio returns by the sub-sample period. Portfolio formation is explained in Table 5.1. The sub-periods are defined according to MSCI Europe index. The normal period runs from January 1992 till the end of the month when the index reached the same level as the lowest point in the down-market period – September 1996. The bubble period follows and ends at the end of the month when the index reached its highest level – September 2000. The down-market period follows and ends at the end of the month when the index reached its lowest level – March 2003. The symbol '***' denotes that the estimated coefficient is significant at the 1% level; '**' at the 5% level; '*' at the 10% level.

Mean Returns in %												
	Germany			France			Netherlands			U.K.		
	1	6	12	1	6	12	1	6	12	1	6	12
Panel A: Normal period												
D1 (low dispersion)	0.59	0.20	0.53	1.20	0.97	1.22	1.38	1.38	1.88	1.05	0.68	1.32
D2	0.39	0.32	0.81	1.20	0.92	1.37	1.57	1.38	1.86	1.03	0.65	1.31
D3	0.49	0.07	0.61	1.08	0.68	1.12	1.61	1.36	2.00	1.06	0.70	1.42
D4	0.13	-0.06	0.35	0.72	0.42	0.99	1.09	1.13	2.12	0.96	0.80	1.66
D5 (high dispersion)	-0.12	-0.11	0.62	0.84	0.45	1.27	1.03	0.74	1.75	1.27	1.00	2.08
D1-D5	0.71**	0.31	-0.09	0.36	0.52	-0.05	0.35	0.64	0.13	-0.22	-0.31	-0.77**
t-statistic	2.05	0.89	-0.23	0.81	1.35	-0.13	0.82	1.50	0.33	-0.50	-0.76	-2.26
Panel B: Bubble period												
D1 (low dispersion)	1.34	1.05	1.09	2.06	2.12	2.05	1.31	1.39	1.38	1.82	1.62	1.53
D2	1.83	1.55	1.49	2.12	1.94	1.86	1.56	1.59	1.55	1.59	1.50	1.51
D3	1.27	1.25	1.23	1.67	2.78	2.60	1.40	1.31	1.33	1.84	1.69	1.67
D4	1.09	0.93	0.78	4.04	2.98	3.09	1.34	1.20	1.25	1.69	1.82	1.74
D5 (high dispersion)	0.24	0.42	0.42	1.76	1.80	1.85	0.78	0.91	0.93	2.13	2.23	2.26
D1-D5	1.10**	0.63	0.68*	0.30	0.32	0.20	0.53	0.48	0.45	-0.31	-0.60	-0.73**
t-statistic	2.15	1.48	1.74	0.65	0.95	0.65	0.89	0.88	0.89	-0.80	-1.60	-2.05
Panel C: Down-market period												
D1 (low dispersion)	-3.19	-3.20	-3.39	-1.20	-1.35	-0.67	-1.17	-1.32	-0.89	-1.32	-1.04	-0.36
D2	-3.35	-3.37	-2.94	-1.84	-1.85	-0.83	-1.34	-1.37	-1.14	-1.03	-1.00	-0.43
D3	-3.54	-3.52	-2.91	-2.35	-2.04	-1.56	-2.69	-2.38	-1.56	-1.72	-1.31	-0.61
D4	-4.05	-4.80	-4.62	-2.15	-2.30	-2.25	-3.02	-3.54	-2.92	-2.03	-2.07	-1.40
D5 (high dispersion)	-5.91	-5.41	-4.91	-3.67	-3.31	-3.66	-3.28	-3.80	-2.98	-3.14	-3.01	-2.53
D1-D5	2.72**	2.21*	1.52	2.47	1.96	2.99***	2.11	2.48*	2.09	1.82**	1.97**	2.17***
t-statistic	2.19	2.03	1.35	1.56	1.31	3.34	1.20	1.73	1.43	1.98	2.67	3.12

Our conclusions for the return differentials in the period between 1992 and 2000 closely match the results for subperiod analysis of Diether *et al*. (2002). They report significant return spreads for their U.S. sample in the period between 1983 and 1991. However, during the 1992 to 2000 period, the significant underperformance of high dispersion stocks disappears. They contribute this effect to the overall decrease in the disagreement among analysts. Further examination is necessary to exclude the possibility that the differences in returns in different subperiods are due to the variation in exposures to priced risk factors in different periods.

5.6 Conclusions

This paper describes the empirical relation between differences of opinion and stock returns. The theoretical model of Miller (1977) claims that uncertainty about stock returns yields a divergence of opinions about expected returns. If investors have different opinions and short selling is constrained, optimistic traders have most influence on stock returns. Consequently, stock prices tend to overstate the true value and subsequent returns will be lower.

We test Miller's hypothesis for a sample of over 3000 firms in France, Germany, the Netherlands and the U.K. over the 1992-2003 period. In an earlier study for the U.S., Diether *et al*. (2002) report that low dispersion stocks indeed outperform stocks with high dispersion. Similar to their study, we choose to approximate differences of opinion by the dispersion of analyst earnings forecasts. Our findings show a strong negative relation between forecast dispersion and subsequent stock returns in France, Germany, and the Netherlands. This result is in line with Miller's hypothesis and the overall results for the U.S. of Diether *et al*. (2002). For the U.K. we find no significant effect. We explain the differences for the U.K. by the lower average dispersion in this country. Moreover, the U.K. results resemble the results of Diether *et al*. (2002) in the comparable subperiod. We check the robustness of our results by employing a multifactor asset pricing model incorporating risk factors related to size, book-to-market, and momentum.

A novel analysis in our paper is a split up of the sample period into subperiods based on the stock market environment, *i.e.* a normal period, a bubble period, a down-market period and recovery period. Inspired by Hong and Stein (2003), who model stock market crashes under the assumption of heterogeneous beliefs, we analyze whether the general direction of the market influences the dispersion-returns relation. In the down market, we find that the negative relation is strongly present in each of the four countries. In the other periods the results are much weaker, and incidentally even significantly positive for the U.K. firms. These findings are difficult to reconcile with existing theory. We believe that more theoretical and empirical is required in order to fully understand the

relation between heterogeneous beliefs and the cross-section of returns in general, and especially the dependence of this relation on the stock market situation.

Chapter 6

Summary and Concluding Remarks

In this thesis we study how the role of financial intermediaries relates to capital structure choices and the performance of firms. Banks and other financial institutions facilitate the transfer of funds from investors to firms. The reason is that, as Freixas and Rochet (1997) suggest, financial intermediaries have a comparative advantage in the transformation of financial securities and contracts, in overcoming informational asymmetries between borrowers and lenders, and in serving as delegated monitors of borrowers. The bank-oriented financial system, as opposed to the market-oriented system, extends the role of banks and, besides debt financing, it allows them to own equity stakes in firms. Their monitoring function is further strengthened by sharing board members with firms. Given the strong position of financial intermediaries, we argue that these institutions have both incentives and means to influence the financial policies of the firms and initiate changes in the underperforming management team.

Moreover, this thesis considers a particular type of informational intermediaries employed by financial institutions, *i.e.* equity analysts. The customers that receive analysts' reports expect that analysts provide them with timely, accurate and unbiased information about the firms they follow. The empirical literature and anecdotal evidence propose that this expectation has not been always met. In this thesis we go beyond this consensus in analysts' opinions, specifically we use individual analyst forecasts that compose this consensus. We argue that the degree of the disagreement among analysts provides valuable insight into their informational environment. We relate this knowledge to the pricing of a firm's equity and the choice of debt maturity. In this last chapter we

summarize the four empirical studies and discuss the relations between empirical results. Besides, we mention the contributions of this thesis and ideas for future research.

Chapter 2 presents the first empirical study. This study examines the effect of asymmetric information between managers and lenders on the debt maturity structure of firms. Information asymmetry between parties is a crucial assumption behind adverse-selection agency theories addressing optimal debt maturity choices. Flannery (1986) introduces a model where firms with favorable private information signal their quality by issuing short-term debt. We improve tests of debt maturity related adverse-selection theories by introducing a proxy for information asymmetry based on the dispersion of analyst earnings per share forecasts. Moreover, this measure also allows us to make distinction between asymmetric information concerning a firm's short-term and long-term earnings. Therefore, we present the first empirical test of the Goswami *et al.* (1995) model, which argues that firms with a large difference between information asymmetry concerning their short and long-term earnings prefer long-term debt. Further, we investigate determinants of debt maturity suggested by several theories and include determinants selected by previous empirical studies to facilitate comparison of the results. The set-up of empirical model takes into account the endogeneity of leverage in the debt maturity decisions.

Our results for a sample of 457 U.S. non-financial firms over the period form 1994 to 1999 show that firms with both information asymmetry about their short-term earnings and positive information rely more on short-term debt. This evidence is consistent with Flannery's (1986) signaling theory. We find no support for the model of Goswami *et al.* (1995) that firms with large differences between the information asymmetries in the two horizons prefer long-term debt. Next, we report a nonmonotonic relationship between the firm's credit quality and its debt maturity, where the best and worst borrowers obtain short-term debt and the intermediate ones issue long-term debt. This study also documents that it is very important to control for leverage in the empirical debt maturity studies. The positive effect of leverage, which is modeled as an endogenous variable, on debt maturity is in line with Diamond's (1991a) model where firms with high leverage optimally issue long-term debt in order to avoid suboptimal liquidation.

Chapter 3 aims to answer the question whether banks influence the capital structure choices of firms. We consider three types of capital structure decisions: leverage, debt maturity and the source of debt. Theoretical models suggest that the three choices might be jointly determined. In contrast to the existing studies that focus on a single decision or, at best, two decisions, we contribute to the literature by modeling all three choices simultaneously. In order to measure the relation between the bank involvement and the capital structure of firms, we have to find a financial system where we can identify different degrees of the ties between banks and a firm. The Netherlands provides an excellent arena for this study, because of the strong position of Dutch banks and multiple

relations with non-financial firms. Our sample consists of 205 Dutch non-financial firms listed on the Amsterdam Exchanges for at least one full calendar year during the ten-year period between 1992 and 2001. After collecting data from various public sources, we are able to identify two types of non-debt relations with banks: banks' equity participations in a firm and bank representations on the board. Therefore, we can distinguish four groups of firms: with no bank relations, with banks as shareholders, with bankers on the board, and with both bank shareholders and board members. Our three-decision model takes into account these four different degrees of bank involvement. This analysis is a contribution to the literature on firm-bank relations as we describe how bank relations influence the firms' capital structure choices. So far, the banking literature has considered the terms of bank debt, without investigating other capital structure choices.

Our results of the three-decision capital structure model support the hypothesis that firm-bank relationships are important in capital structure choices. We find that bank debt has a negative effect on leverage in firms with banker on the board, while this relation is absent in the firms without bank involvement. This result suggests that banks maximize the value of their loans by reducing overall leverage. The finding is also consistent with the preference of banks for low risk loans (Carey *et al*. (1998)). We confirm Diamond's (1991a) liquidity risk theory because the absence of bank relations increases the effect of leverage on maturity. Bank involvement reduces liquidity risk. We find a strong trade-off between bank debt and maturity, which is independent of bank involvement.

Chapter 4 investigates the role of investors in disciplining the management of firms by the means of forcing them to leave their positions. We focus on Dutch listed firms and study the board turnover for several reasons. All exchange-listed firms operate under a two-tier board structure, in which a supervisory (non-executive) board is a separate body with the task to monitor the managerial (executive) board, chaired by the CEO. While corporate law prescribes independence of the supervisory board from the company, anecdotal evidence suggests that supervisory boards might not be capable of critical managerial board monitoring. We also do not expect that shareholders have the power to effectively discipline the top management, given their limited voting rights in place. Traditionally, financial institutions play a major role in the governance of Dutch firms. In Chapter 3 we demonstrated that as they share board members with firms, they are able to use this position to safeguard their interests. Therefore we hypothesize that the presence of the financial institution representatives on the supervisory board might by critical for removing an underperforming CEO.

We study the board turnover for a sample of Dutch listed firms in the period between 1992 and 1999. We find that forced board turnover is highest among CEOs and lower among members of the managerial board. The fraction of departures of members of the supervisory board more than doubles in the year of CEO turnover, and in the years before and after. This result seems to be a sign of the weakness of the supervisors and their

aim to protect their reputation. Managers other than the CEO are also more likely to leave at the same time as the CEO. We also report a significant relation between lagged performance and forced departure of CEOs and other board members. The sensitivity of turnover to performance is exclusively driven by the supervisory board characteristics. Both the size of the board and the presence of financial institutions increase the disciplinary power of boards. On average, we find no significant wealth effects of CEO turnover. In explaining the variation across abnormal returns, we find that interim succession and concentrated ownership tend to decrease abnormal returns, whereas forced turnover induces more positive wealth effects. We conclude that board structures of Dutch firms are determined within the board itself, which indicates that the institutional setting has a large impact on board effectiveness.

In Chapter 5 we investigate whether the heterogeneity of investor believes affects stock prices. This chapter presents the first European test of the Miller's (1977) hypothesis that stock prices will reflect valuations of optimistic investors if pessimistic investors are kept out of the market, *e.g.* by short-sale constraints. This price optimism model implies that more disagreement about a stock's value leads to a market price above its true value, and lower future returns. Following Diether *et al*. (2002), who tested this proposition for a sample of U.S. stocks, we measure differences in opinions by dispersion of analyst earnings forecasts. We further extend their analysis by examining the relation between dispersion and stock returns under different market conditions. This analysis is motivated by Hong and Stein's (2003) theory of market crashes where the accumulated hidden information of pessimistic investors is revealed during periods of market decline when optimists leave the market.

Our sample contains stocks listed in Germany, France, the Netherlands, and the U.K. between January 1992 and July 2003. We allocate stocks to portfolios based on their dispersion, and measure the subsequent returns for different portfolio holding periods. We also assign stocks intro groups based on other risk factor, besides dispersion, such as size, book-to-market, and momentum. The overall results suggest that stocks with high dispersion of analyst forecasts have lower returns than low dispersion stocks. The return patterns we find for German and Dutch stocks demonstrate that size, book-to-market, and momentum effects do not explain the underperformance of high dispersion stocks. On the contrary, the three risk factors seem to capture most of the dispersion effect in France. There are no signs of a dispersion effect for U.K. stocks. The multifactor time-series tests for the spreads in monthly returns between low and high dispersion portfolios provide further evidence for a dispersion effect even after controlling for systematic risk. For all countries, except the U.K., and all holding periods, the alphas are positive with values between 10 and 100 basis points. Finally, our analysis supports the idea that pessimistic opinions are revealed in the period of market decline (September 2000 till March 2003)

when the dispersion effect was strongest in all four countries with monthly return spreads ranging between two and three hundred basis points.

Although the four empirical studies in this thesis have been presented separately, their results are closely related. Chapters 2 and 3 study capital structure decisions in the U.S. and the Netherlands, respectively. Both empirical studies view debt as a heterogeneous financing source. Our models investigate specific characteristics of debt, such as its maturity and the choice of lender. Further our analysis stresses that the choice of the structure of debt is not independent from the debt-equity decision. In addition, chapter 3 examines how capital structure decisions are influenced by the strength of the relationships between banks and a firm in a bank-oriented financial system. Future research might address whether also in market-oriented systems, such as the U.S., the banks are able to affect corporate policies. This task requires the identification of all feasible channels that banks might use to promote their interests in firms. It remains an empirical question whether providing loans to firms gives banks enough means and incentives to influence firms' financing decisions.

This thesis finds evidence that financial institutions are able to affect corporate policies and that the disagreement among their equity analysts is related to the opinions of firms' investors. Chapters 3 and 4 suggest that in the Netherlands, banks and financial institutions, respectively, use their supervisory board positions to exercise control over financing policies of firms and to discipline the top management. Future research is needed to establish whether the representatives of financial institutions act in order to secure the safety of their loans or whether they generally promote conservative financing choices. Publicly available information about firms' debt does not allow us to identify the actual identity of lenders beyond their bank versus non-bank characteristic. Although in recent years some firms have begun to disclose in their annual reports more detailed loan information, generally it is not possible to directly link a banker on the board to his portion of debt financing in the firm. Moreover, a better reporting of maturities of individual debt instruments would enable us to construct a more subtle measure of the overall firm debt maturity. A measure going further than discriminating between short-term and long-term debt would provide a better tool to test debt maturity theories.

In Chapters 2 and 5 the disagreement among analysts allows us to make inferences about their informational environment that is relevant for the debt maturity decisions and asset pricing. The difference of opinions among analysts is a largely unexplored area. Our approach was to apply dispersion in analyst earnings forecasts as a proxy for variables that are otherwise very difficult to measure. In chapter 2 dispersion helps to quantify the information asymmetry between a firm's managers and lenders. In chapter 5 the disagreement among analysts proxies the differences in investor opinions.

Our analysis of the relation between dispersion and stock returns in Europe is one of the first attempts to shed more light on this area. More research is needed to explain

some of the differences between countries that we observed. Ideally, one should prove that they are due to institutional differences, *e.g.* ease of shorting, and not to specific sample characteristics. Future research can also focus on the empirical testing of hypotheses that link heterogeneity of investor opinions to market bubbles and crashes. Our empirical evidence suggests that the relation between differences in opinion and stock returns is strongest after the burst of the bubble. Finally, it is important to answer the question whether there is a relation between forecast dispersion and consensus forecast (Scherbina (2003)). If some of the pessimistic analysts are discouraged to report their negative forecasts (and when the level of disagreement is high, it is more likely that forecasts that are not reported are lower relative to the average opinion), the mean of the reported forecast will be positively biased. Then the relationship between the dispersion and stock returns could be attributed to the correlation between dispersion and mean forecast.

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Samenvatting (Summary in Dutch)

Dit proefschrift onderzoekt het effect van financiële intermediairs op vermogensstructuren, corporate governance structuren en de financiële prestatie van bedrijven. Over de hele wereld hebben financiële intermediairs omvangrijke en invloedrijke posities in de financiële markten. De financiële intermediairs hebben zowel prikkels als middelen om het financiële beleid van bedrijven te beïnvloeden en veranderingen in de governance structuur te initiëren bij ondermaats presterende managementteams. Investeerders daarentegen hebben slechts beperkte mogelijkheden om controle uit te oefenen ondanks dat zij vreemd of eigen vermogen verschaffen.

Dit proefschrift bestaat uit vier empirische studies. Hoofdstuk 2 bevat een empirische studie naar de effecten van asymmetrische informatie tussen managers en verschaffers van vreemd vermogen op de looptijdenopbouw van het schuldpapier van de onderneming. Informatie asymmetrie tussen participanten is een cruciale aanname bij adverse selection theorieën toegepast op de keuze van de looptijdenopbouw van het schuldpapier van de onderneming. Flannery (1986) introduceert een model waarin bedrijven met gunstige private informatie hun kwaliteit kenbaar maken door middel van de uitgifte van kortlopend vreemd vermogen. Wij verbeteren tests van deze adverse selection theorieën door middel van de introductie van een variabele die gerelateerd is aan de mate van asymmetrische informatie. Deze variabele is de spreiding in de voorspellingen van de winst door analisten. Deze variabele stelt ons bovendien in staat om onderscheid te maken in asymmetrische informatie op de korte en op de lange termijn. We doen de eerste empirische test van het Goswami, Noe, en Rebello (1995) model. Dit model toont dat bedrijven die een groot verschil hebben in asymmetrische informatie betreffende korte en lange termijn winstontwikkelingen, een voorkeur hebben voor langlopend vreemd vermogen. Wij onderzoeken tevens andere determinanten van de looptijden van het vreemd vermogen. Deze determinanten zijn geselecteerd op basis van eerdere studies in dit aandachtsgebied. Hiermee maken wij een vergelijking van onze bevindingen met eerdere

studies mogelijk. De opzet van de empirische tests houdt er rekening mee dat de keuze van de schuldratio endogeen is met betrekking tot de keuze van de looptijdenstructuur.

Onze resultaten voor een steekproef van 457 niet-financiële Amerikaanse bedrijven over de periode van 1994 tot 1999 laten zien dat bedrijven met asymmetrische informatie op het gebied van korte termijn winsten en positieve niet-publiekelijk beschikbare informatie, een voorkeur hebben voor kortlopend vreemd vermogen. Dit bewijs is consistent met de signaaltheorie van Flannery (1986). We vinden geen aanwijzingen in overeenstemming met het Goswami, Noe, en Rebello (1995) model dat betoogt dat ondernemingen met grote verschillen in de mate van asymmetrische informatie voor de korte en lange termijn een voorkeur hebben voor langlopend vreemd vermogen. Vervolgens rapporteren wij een niet-monotone relatie tussen de kredietwaardigheid en de looptijdenstructuur van het vreemd vermogen. De meest en de minst kredietwaardige bedrijven lenen bij voorkeur kortlopend, en bedrijven met een gemiddelde kredietwaardigheid lenen bij voorkeur langlopend. Deze studie demonstreert ook dat het zeer belangrijk is te controleren voor de endogeniteit van de solvabiliteitsratio in empirische onderzoeken naar de looptijdenkeuzes. Het positieve effect van eigen vermogen op de looptijd van het vreemd vermogen is overeenkomstig met het model van Diamond (1991a) waarin bedrijven met relatief veel eigen vermogen langlopend lenen met het oog op het voorkomen van suboptimale liquidatie.

Hoofdstuk 3 beoogt de vraag te beantwoorden of banken de vermogensstructuur van bedrijven beïnvloeden. Wij beschouwen drie vermogensstructuurbeslissingen: de verhouding eigen vermogen en vreemd vermogen, de looptijdenkeuze van het vreemd vermogen, en de identiteit van de verschaffers van het vreemd vermogen. Theoretische modellen laten zien dat deze drie keuzes tegelijkertijd tot stand komen. Bestaande empirische studies onderzoeken veelal ieder van deze keuzes in isolatie. Slechts enkele studies hebben betrekking op twee van de drie beslissingen. Wij bestuderen de drie keuzes en hun onderlinge afhankelijkheden. Om het effect van banken op de vermogensstructuur te kunnen bepalen hebben wij een financieel systeem nodig met uiteenlopende betrokkenheid van banken bij bedrijven. Het Nederlandse systeem is een buitengewoon aantrekkelijk studieobject vanwege de sterke positie van Nederlandse banken en haar vele relaties met niet-financiële ondernemingen.

Onze steekproef bestaat uit 205 niet-financiële bedrijven die voor ten minste een vol kalenderjaar genoteerd zijn geweest op de Amsterdam Exchanges in de tienjarige periode tussen 1992 en 2001. Wij identificeren twee type relaties die niet direct betrekking hebben op vreemd vermogen: het verstrekken van eigen vermogen door banken en representanten in de Raad van Bestuur en Raad van Commissarissen. Dientengevolge identificeren wij vier typen bedrijven: bedrijven zonder relaties met banken, bedrijven met banken als aandeelhouders, bedrijven met bankiers in de Raad van Bestuur of Raad van Commissarissen, en bedrijven met zowel banken als aandeelhouders en bankiers in de

Raad van Bestuur of Raad van Commissarissen. Wij testen ons model voor de drie genoemde beslissingen in elk van de vier groepen. De analyse draagt bij aan de literatuur over de invloed van banken omdat het verschillende vermogensstructuur beslissingen simultaan bekijkt.

Onze resultaten afkomstig van het model met de drie vermogens-structuurbeslissingen bevestigen de hypothese dat relaties met banken belangrijk van invloed is op vermogensstructuurbeslissingen. We vinden dat de variabele "bankschuld" een negatief effect heeft op de schuldratio als een bankier in een van de raden zit, terwijl deze relatie niet wordt gevonden als er geen bankier zitting heeft in de Raad van Bestuur en Raad van Commissarissen. Dit resultaat suggereert dat banken de waarde van het vermogen afkomstig van banken maximaliseren door het aandeel van het vreemd vermogen in het totaal vermogen te reduceren. Deze bevinding is overeenkomstig met de voorkeur van banken voor leningen met een laag risico (Carey *et al*. (1998)). We vinden ook bevestiging voor de liquiditeitsrisicotheorie van Diamond (1991a). Het effect van het percentage vreemd vermogen op de looptijd van het vreemd vermogen is namelijk sterker als een bedrijf geen van de bovenstaande relaties heeft met een bank. Als banken in het spel zijn, dan is het liquiditeitsrisico lager. We vinden een sterke afruil tussen de variabele "bankschuld" en de looptijd van het vreemd vermogen. Deze relatie is onafhankelijk van de aard van de relatie met banken.

Hoofdstuk 4 onderzoekt de rol van investeerders in het disciplineren van het management van een bedrijf door middel van gedwongen ontslag. We richten onze aandacht op Nederlandse beursgenoteerde ondernemingen en bestuderen veranderingen in de Raad van Bestuur en Raad van Commissarissen om uiteenlopende redenen. Alle beursgenoteerde bedrijven opereren onder een "two-tier" structuur. Hierin is de Raad van Commissarissen een onafhankelijk orgaan met de taak toezicht te houden op de Raad van Bestuur. Ondanks dat het Nederlandse ondernemingsrecht voorschrijft dat de Raad van Commissarissen onafhankelijk is van de onderneming, is het mogelijk dat de Raad van Commissarissen niet altijd hun kritiek kan of wil uiten. We verwachten ook niet dat aandeelhouders altijd de macht hebben de Raad van Bestuur effectief te disciplineren, geven dat stemrecht beperkt kan zijn. Traditioneel spelen banken een belangrijke rol in Nederland bij het disciplineren van de leiding van een bedrijf. In hoofdstuk 3 lieten wij al zien dat banken hun belangen veilig stellen als zij sterke banden hebben met de Raad van Commissarissen. Onze hypothese is dat de aanwezigheid van representanten van banken in de Raad van Commissarissen een belangrijke factor is bij gedwongen ontslagen van CEOs die ondermaats presteren.

We bestuderen veranderingen in de Raden van Bestuur en Commissarissen bij Nederlandse ondernemingen over de periode tussen 1992 en 1999. We vinden dat de kans op gedwongen ontslag het hoogst is onder CEOs en lager onder de andere leden van het Raad van Bestuur. Het percentage dat gedwongen wordt de Raad van Commissarissen

verlaten is meer dan tweemaal zo hoog als ook de CEO is ontslagen in hetzelfde jaar of een jaar ervoor, of wordt ontslagen in het volgend jaar. Dit resultaat is een teken van de zwakte van de commissarissen en hun doel tot behoud van hun eigen reputatie. Er is een verhoogde kans dat managers de onderneming verlaten als ook de CEO weggaat. We rapporteren tevens een significante relatie tussen prestatie en het gedwongen verlaten van de onderneming door de CEO en andere leden van de Raad van Bestuur. Hoe groot de kans is dat leden van de Raad Bestuur worden weggestuurd na slechte resultaten hangt sterk af van enkele kenmerken van de Raad van Commissarissen. Zowel de omvang als de aanwezigheid van financiële dienstverleners vergroten de disciplinerende macht van de Raad van Commissarissen. Wij vinden geen significante abnormale koersbewegingen bij een wisseling in de CEO positie. Wij vinden dat tussentijdse opvolging en geconcentreerd eigendom een negatief effect hebben op abnormale rendementen, terwijl gedwongen ontslag een positief effect heeft op abnormale rendementen. Wij concluderen dat de samenstelling van de Raad van Bestuur en Raad van Commissarissen van Nederlandse ondernemingen van binnenuit tot stand komen, en dit toont dat de institutionele omgeving belangrijk is voor de effectiviteit van het bestuur en toezicht.

In hoofdstuk 5 onderzoeken wij of heterogeniteit van de meningen van beleggers een effect heeft op aandelenkoersen. Het hoofdstuk test de hypothese van Miller (1977) die stelt dat aandelenkoersen meer de opvattingen van de optimistische beleggers weergeven dan van pessimistische beleggers, omdat pessimistische beleggers problemen ondervinden om hun opvattingen in positieve rendementen te vertalen. Lenen van aandelen is niet voor iedereen even gemakkelijk. Deze hypothese impliceert dat hoe groter de verschillen in opvattingen en voorspellingen, des te hoger ligt de koers van een aandeel boven zijn werkelijke waarde en des te lager zijn de toekomstige rendementen. In navolging van Diether *et al.* (2002), die de genoemde hypothese voor Amerikaanse aandelen hebben getest, meten wij de verschillen in opvattingen aan de hand van de spreiding in de winstschattingen van beleggingsanalisten. Wij breiden de test van Diether *et al.* (2002) uit door de relatie tussen de spreiding in opvattingen en aandelenrendementen te testen onder verschillende marktomstandigheden. Deze uitbreidingen lijken zinvol volgens de theorie van Hong en Stein (2003). Deze theorie stelt dat een krach de gecumuleerde negatieve opvattingen van analisten die eerst verborgen aanwezig waren, vrij maakt terwijl de optimisten het toneel verlaten.

Onze steekproef bevat aandelen die genoteerd waren in Duitsland, Frankrijk, Nederland en Engeland in de periode januari 1992 en juli 2003. We verdelen de aandelen over verschillende portefeuilles afhankelijk van de mate van spreiding in opvattingen. Vervolgens bepalen wij de rendementen van deze portefeuilles over verschillen beleggingsperioden. Wij verdelen de aandelen ook over meerdere portefeuilles op basis van de marktkapitalisatie, de boekwaarde-marktwaarde ratio en het prijsmomentum. De resultaten laten zien dat aandelen met een relatief hoge spreiding in opvattingen een

relatief laag rendement hebben. Voor de Duitse en Nederlandse markt geldt dat de lage returns van aandelen met een hoge spreiding niet verklaart kunnen worden door marktkapitalisatie, boekwaarde-marktwaarde ratio en prijsmomentum. Voor de Franse markt daarentegen kan wel een groot gedeelte van de lagere rendementen verklaart worden door deze drie risicofactoren. Voor de Engelse markt vinden wij geen effect van de mate van spreiding op aandelenrendementen. Wij passen een multi-factor tijdsreeksanalyse toe op het verschil in rendement tussen een lage-spreiding portefeuille en een hoge-spreiding portefeuille. Deze tijdsreeksanalyse bevestigt het bestaan van een spreiding effect voor alle onderzochte landen behalve voor Engeland, ook na controle voor de effecten van de drie risicofactoren. Voor alle onderzochte beleggingsperioden en alle onderzochte markten, behalve voor Engeland, waren de alpha's positief met waarden tussen de 10 en 100 basispunten. Tenslotte, onze resultaten komen overeen met de theorie dat in perioden van dalende markten (september 2000 tot en met maart 2003) pessimistische opvattingen relatief veel gewicht krijgen in de prijsvorming van aandelenkoersen. De koersen van de lage-spreiding portefeuille was voor alle vier de markten per maand gemiddeld twee tot drie procent beter dan die van de hoge-spreiding portefeuille.

Hoewel in dit proefschrift de vier empirische studies apart worden beschreven en behandeld, zijn de methodes, onderwerpen en bevindingen aan elkaar gerelateerd. In hoofdstukken 2 en 3 bestuderen wij beslissingen aangaande de vermogensstructuur in Nederland. Onze analyses benadrukken dat de keuze van de samenstelling van het vreemd vermogen afhankelijk is van de verhouding tussen vreemd en eigen vermogen. In de hoofdstukken 3 en 4 laten wij zien dat in Nederland banken en andere financiële instellingen hun aanwezigheid in de Raad Commissarissen gebruiken om financiële beslissingen van ondernemingen te controleren en het bestuur te disciplineren. In de hoofdstukken 2 en 5 gebruiken wij de mate waarin analisten van mening verschillen om te onderzoeken hoe informatieverschillen en informatieverwerking een effect hebben op vreemd vermogen en aandelenkoersen.

Curriculum vitae

Petra Daniševská was born in Pardubice, the Czech Republic, in 1975. From 1993 till 1999 she studied financial economics at the University of Economics in Prague. During this time she spent half a year as an exchange student at the University of Plymouth in the U.K. She furthermore completed an internship on initial public offerings in the research department of the ING Investment Management in The Hague. From 1997 till October 1999 she worked as an analyst in the reporting and planning department of the Nationale Nederlanden in Prague. In 1999, she graduated with major in financial economics and minor in European economic integration.

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This thesis comprises four empirical studies. In the first study, the author analyses the impact of information asymmetry between the U.S. firms and their lenders on firms' choice of debt maturity. The second study shows how firm-bank relations in the form of shared board positions and equity ownerships influence capital structure decisions of Dutch firms. The following examination in the third study of Dutch managerial and supervisory board turnover further demonstrates the strong position of financial institutions in disciplining underperforming management. The fourth and final analysis in this thesis relates the dispersion in analyst forecasts to the differences in investor opinions and investigates how the heterogeneity of investor beliefs affects prices of European stocks.

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