WHICH VERSION OF THE EQUITY MARKET TIMING AFFECTS CAPITAL STRUCTURE, PERCEIVED MISPRICING OR ADVERSE SELECTION?

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Baker and Wurgler (2002) define a new theory of capital structure. In this theory capital structure evolves as the cumulative outcome of past attempts to time the equity market. Baker and Wurgler extend market timing theory to long-term capital structure, but their results do not clearly distinguish between the two versions of market timing: perceived mispricing and adverse selection. The main purpose of this dissertation is to empirically identify the relative importance of these two explanations.

First, I retest Baker and Wurgler’s theory by using insider trading as an alternative to market-to-book ratio to measure equity market timing. I also formally test the adverse selection model of the equity market timing: first by using post-issuance performance, and then by using three measures of adverse selection. The first two measures use estimates of adverse information costs based on the bid and ask prices, and the third measure is based on the close-to-offer returns.

Based on received theory, a dynamic adverse selection model implies that higher adverse information costs lead to higher leverage. On the other hand, a naïve adverse selection model implies that negative inside information leads to lower leverage.

The results are consistent with the equity market timing theory of capital structure. The results also indicate that a naïve, as opposed to a dynamic, adverse selection model seems to be the best explanation as to why managers time equity issues.
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CHAPTER 1

INTRODUCTION

A firm’s capital structure is its mix of different forms of financing. The goal of a capital structure policy is to find the combination of securities that would maximize firm value. Several theories such as the static tradeoff, the pecking order, and the managerial entrenchment theory try to address the issue of the motivations behind managers’ choice of a given capital structure.

Baker and Wurgler (2002) (hereafter BW) define a new theory of capital structure. In this theory, “capital structure evolves as the cumulative outcome of past attempts to time the equity market.” To test their hypotheses, BW use the “external finance weighted-average market-to-book ratio”. This variable, which is supposed to measure historical variations in the market-to-book, is found to have a stronger relationship with leverage than the contemporaneous market-to-book.

According to BW, managers systematically time equity issues when market-to-book levels are high. Therefore, there should be a negative relationship between the historical measure of variations in the market-to-book ratio and leverage. However, there may be two motives behind market timing: perceived mispricing and/or adverse selection.

In a test of the perceived mispricing model, authors such as Lucas and McDonald (1990), La Porta et al. (1997), and Shleifer (2000) document that managers issue equity when they think that its cost is irrationally low, and repurchase when they think the cost is irrationally high. This model implies irrational managers and/or investors, and time-varying mispricing process. There
may not be actual mispricing, but managers act as if they think there is one. Hence, even though
the market efficiency assumption still holds, managers behave like technical analysts. Therefore,
the perceived mispricing explanation suggests a negative relationship between leverage and
market-to-book.

The adverse selection theory, which is a dynamic version of Myers and Majluf (1984), is
derived assuming rational managers and investors but varying adverse selection costs. These
costs can vary across firms or across time. Adverse selection is shown to influence financing
decisions at the corporate level (Korajczyk et al. (1991)) and at the market level (Bayless and
Chaplinsky (1996)). Korajczyk et al. (1991) find that information releases have an effect on the
pricing and timing of equity issues. Bayless and Chaplinsky (1996) show that managers’ timing
of equity issues are negatively related over time to the aggregate levels of information
asymmetry in the market.

However, when managers have inside information, they will also have an incentive to sell
equity when they “know” that it is overvalued. This supposes that the inside information
managers have outweighs the negative signal that accompanies equity issues. This naïve version
as well as the dynamic version of the adverse selection theory also implies a negative
relationship between leverage and market-to-book ratio.

It is thus not clear whether the negative relationship between leverage and market-to-
book that BW attribute to market timing is due to perceived mispricing or to adverse selection.
The objective of this research is to empirically examine the long-term influence of adverse
selection and perceived mispricing on capital structure. I hope to be able to identify clearly the
primary motive underlying the relationship between equity market timing and capital structure.
Chapter 2 surveys the capital structure and adverse selection theories. First, capital structure theories and other determinants of capital structure are presented. Second, market timing theory of capital structure is introduced. Finally, a detailed literature survey of financing decisions and adverse selection is provided.

Chapter 3 develops the testable hypotheses. I start the chapter by using insider trading as an alternative measure to test for the market timing theory. Subsequent performance is also used in retesting market timing theory. Next, various measures of adverse selection are presented, as well as their correlations with each other and with market-to-book. A series of tests analyzing the short-term relationship between the change in leverage, and its components, and adverse selection are proposed. Lastly, the long-term relationship between leverage and the weighted average adverse selection is examined using a series of regression analyses. A size effect test is presented at the end of the analysis.

Chapter 4 describes the data and also describes how the hypotheses are tested. The sample comes from Standard & Poor’s COMPUSTAT ® (North America) data and covers the period 1987-2000. The sample is restricted to firms with a minimum book value of assets of $10 million. It also excludes financial firms and firm-year outliers. When bid and ask prices are used, the sample consists of firms from Compustat for which I could match the data with the bid-ask spread, price, and volume data from CRSP. Insider trading and holdings data come from the Ownership Reporting System (ORS) tapes. Information on monthly returns is obtained from CRSP. The equity issues data come from the SEC’s Registrations and Offering Statistics (ROS) data tapes.

Chapter 5 presents the results. The first set of results pertaining to the retest of the equity market timing theory provides support for the theory. Net insider selling, as an alternative to the
market-to-book ratio by Baker and Wurgler (2002), is negatively related to the change in leverage and positively related to market-to-book. Weighted average net insider selling is negatively related to the debt ratio. These results support BW’s equity market timing theory of capital structure.

I also find a small but positive correlation between the change in leverage and subsequent performance, for companies that issue equity and are net insider sellers. Dummy variables based on sub-groups of the latter companies that either consistently under-perform the matched control portfolio or rank at the lowest deciles on subsequent performance are negatively related to the debt ratio. This result supports the naïve version of the adverse selection model based equity market timing. It suggests that managers issue equity when it is overpriced based on inside information. These equity timing issues are thus reflected in the long-term leverage ratios.

The second set of results concerns the dynamic adverse selection theory of equity market timing. I use three proxies for adverse selection in my tests: close-to-offer returns and two measures of the adverse selection component of the bid-ask spread. I show that there is a small but positive correlation between market-to-book and adverse selection. I also find that the change in leverage is negatively related to the adverse selection component of the spread. These latter relationships come mainly from the net equity issues component of the change in leverage. Finally, using multiple regressions with different proxies for adverse selection, the results are inconclusive. The mixed results do not support the dynamic adverse selection version of the timing theory.

In chapter 6, I discuss the results and present an argument for the naïve version of the adverse selection motive underlying market timing theory. A company may choose to issue equity only to build slack; especially when managers know that, based on inside information,
equity is overvalued. With no target optimal capital structure, managers do not appear to rebalance to optimal levels of debt after timing the market. This causes the equity issues decisions to have a permanent effect on the leverage ratio.
LITERATURE REVIEW

Capital Structure Theory

The firm’s mix of different forms of long-term financing is known as its capital structure. The goal of a capital structure policy is to find the combination of securities that would maximize firm value. Several theories try to address the issue of the motivations behind managers’ choice of a given capital structure and whether there is an optimal capital structure.

Tradeoff theory

The modern theory of capital structure starts with the work of Modigliani and Miller (1958). They conclude that capital structure has no effect on firm value in perfect capital markets with no taxes. However, Modigliani and Miller (1963) find that there is a difference between the value of a levered firm and that of an unlevered firm. This difference is the value of the interest tax shield. The value of a levered firm increases with the level of interest on the debt it carries. This result suggested that managers should seek 100% debt as the optimal leverage to maximize the corporate value. When we take into consideration market imperfections, the tradeoff theory suggests that an optimum leverage can be reached by considering not only taxes, but also imperfections, such as costs of financial distress and agency costs.

The tradeoff theory suggests that firms would seek more debt as long as the present value of the tax shield is greater than the present value of bankruptcy, agency, and all other costs associated with higher leverage.
Agency costs

An agency relationship is one in which one or more owners (principals) delegate the management responsibilities to managers (agents) because of a lack of time or skills. The goal of each one of these entities is self-profit maximization. However, principals cannot maximize their profits without the help of agents, and agents’ profit objectives may not coincide with the principals’; therefore, agency problems arise. Moreover, bondholders, who see managers as acting exclusively in the best interests of shareholders, try to protect their expected income stream by preventing managers from engaging in high uncertainty projects.

Initially this theory developed by Jensen and Meckling (1976), Myers (1977), and Jensen (1986). Jensen and Meckling’s (1976) study comes up with a closed-form solution to optimal leverage, Myers’s (1977) study equates shareholders’ ownership to a call option, and Jensen’s (1986) free cash flow lead to an optimal amount of leverage.

Jensen and Meckling (1976) define agency costs as the sum of (1) monitoring costs, (2) bonding costs, and (3) residual loss. Monitoring costs are those costs incurred by the principals in their effort to monitor management. Bonding costs are those incurred by management in their efforts to show their good intentions to the principals. The rest is the residual loss. A firm is a home to agency problems between shareholders and managers, between shareholders and bondholders, and between bondholders and managers. Bondholders, as ultimate owners of the firm in case of bankruptcy, insist on bonds covenants in which they try to prevent any attempt by managers to act in the sole interest of the shareholders. They have a tendency to make managers take only safe projects even if the return is low, while shareholders may some times prefer high-return, high-risk projects.
In the case of an all equity firm, there are no agency costs of debt, and managers would act solely in the best interest of the shareholders. Furthermore, the shareholders are not as tempted by risk as they would be in the presence of bondholders. All their interest is in high net present value projects. Agency costs of equity increase as new shares are sold to outside shareholders. New shareholders will incur monitoring costs to ensure that old shareholders (owner-shareholders) act in the best interest of all shareholders. As debt is sold and leverage increases, agency costs of debt also increase, while the proportion of equity, and agency costs of equity, decreases. The result is a decrease in the total agency costs. Jensen and Meckling argue that there is an optimum amount of leverage that would be associated with a minimum amount of total agency costs.

A substantial portion of the value of a firm is composed of intangible assets, in the form of future investment opportunities. Myers (1977) shows that if the shareholders’ claim on the assets of a levered firm is similar to a call option, then shareholders have an incentive to undertake riskier projects because their call option value is greater when the assets of the firm have higher variance. If a firm with long-term, risky outstanding debt undertakes positive NPV projects, shareholders will not be able to capture the full benefits because part of the value goes to debt holders in the form of a reduction on the probability of default. Myers, therefore, predicts that firms with high levels of information asymmetry will suffer from underinvestment.

Jensen (1986) defines free cash flow as those cash flows in excess of what is required for funding all projects that have positive NPV when discounted at the relevant cost of capital. Managers have incentives to cause their firms to grow beyond the optimal size. Growth increases managers’ power by increasing the resources under their control. Debt reduces the agency costs of free cash flow by reducing the amount of cash under management control. The optimal debt-
equity ratio is the point at which firm value is maximized, the point where marginal costs of debt just offset the marginal benefits.

Secured debt

Most authors of capital structure literature argue that the type of assets owned by a firm affects its capital structure choice, partly because of bankruptcy costs. Scott (1976) shows that optimal leverage is related to secured debt because the latter is collateralized by tangible assets. He argues that firms with assets that can be used as collateral may be expected to issue more debt since in case of bankruptcy any losses to bondholders are limited.

Support for this theory is provided by Myers and Majluf (1984). They show that, under asymmetric information, firms may find it advantageous to sell secured debt because issuing equity is costly. Since management is supposed to have better information about earnings prospects, outside investors prefer to invest in debt backed by secured assets.

Also, as suggested by Myers (1977), shareholders have an incentive to induce managers to invest in high risk projects which will increase their call value. Since collateralized debt can only be used for the intended purpose, a positive relationship will exist between debt ratios and the capacity of firms to collateralize their debt. As debt is collateralized, bondholders fear less the expropriation of their wealth by shareholders. This can reduce the underinvestment problem.

Pecking order theory

As a substitute to the theory of tradeoff between tax shield, financial distress and agency costs, the pecking order theory explains capital structure in terms of management choice of financing in response to asymmetric information. The theory does not support the existence of an optimal capital structure.
Myers (1984) argues that because of asymmetric information, companies will prefer to use their retained earnings to finance growth opportunities. If further financing is required, preference will be given to secured debt first, then convertible debt, and then equity.

Myers and Majluf’s (1984) assumptions are as follows:

1. Managers, better than anyone else, are assumed to know the true future value of the firm.
2. Furthermore, they are assumed to act in the interest of old shareholders who are assumed to be passive.

Under the pecking order theory, whenever a firm needs financing, it would start by using all its retained earnings and then its debt capacity. A firm with enough slack does not need to go to the capital market for financing. However, a firm with too much slack would fall under Jensen’s free cash flow problem. Managers cannot retain big amounts of cash without disbursing it. They are urged by shareholders either to invest free cash flow or pay it as dividends. Once slack is used, a firm would turn to debt financing. Managers use all their debt capacity before issuing stocks.

A dynamic version of Myers and Majluf (1984) is behind the present research of capital structure and adverse selection, and will be studied in more detail in the following sections.

Managerial entrenchment theory

Managerial entrenchment is one of the theories proposed, by several authors, to explain capital structure. Proponents of this theory argue that subjective reasons may determine leverage choices made by managers. However, different conclusions are drawn by Agrawal and Mandelker (1987), and Mehran (1992) on one hand, and Friend and Lang (1988), and Berger, Ofek, and Yermack (1997) on the other hand.
Agrawal and Mandelker (1987) suggest that the security holdings of managers of firms with a debt-equity ratio that increases are larger than those for which this ratio decreases. Also, when managers make financing decisions, executive security holdings have a preponderant role in reducing agency problems.

Consistent with the predictions of the agency theory, Mehran (1992) finds a positive relationship between the firm’s leverage ratio and the percentage of the following:

1) Executives’ total compensation in incentive plans.

2) Managers’ owned equity.

3) Investment bankers on the board of directors.

4) Large individual investors’ owned equity.

On the other hand, Friend and Lang (1988) show that the level of debt decreases as the level of management investment (shareholding) in the firm increases. This finding is independent of the existence of any kind of non-managerial principal stockholders. These are assumed in Friend and Lang’s study to have sufficient investment in the firm to warrant the effort required for monitoring and to influence management appropriately. Moreover, when corporations have large non-managerial investors, the average debt ratio is significantly higher than in those with no principal stockholders. This result suggests that the existence of large non-managerial stockholders might make the interests of managers and public stockholders coincide.

Berger et al. (1997) find evidence that firm leverage is affected by the degree of managerial entrenchment, and that entrenched managers seek to avoid debt. They find that leverage is lower when the CEO has a long tenure in office, has weak stock and compensation incentives, and does not face strong monitoring from the board of directors or major stockholders.
Managers can use leverage to inflate the voting power of their equity as suggested by Stulz (1988). When firms are targets of tender offers, it is argued that entrenched managers use leverage as a defensive device to buy time for the implementation of their own restructuring program instead of the outside raider’s. The literature on mergers and acquisitions offer several situations in which agency costs increase because of managers’ self interests.

On the effect of managerial incentives to bear risk on capital structure, Nam, Ottoo, and Thornton (2003) find that as the CEO’s sensitivity to stock-return volatility increases, the firm chooses higher debt ratios. CEO’s with low sensitivity to stock-return volatility choose lower debt ratios. Nam et al. argue that when firms have relatively low outside monitoring, managerial incentives to bear risk play a stronger role in determining the level of debt in their capital structure. The degree of outside monitoring, thus, attenuates the relationship between managers’ sensitivity to return volatility and the degree of financial leverage.

*Uncertainty and risk management*

Many authors argue that there is an inverse relationship between optimal debt level and the volatility of earnings. Stulz (1996), Ross (1997), and Leland (1998) show that, by reducing the volatility of income, hedging increases debt capacity. However, counter-examples to this basic hypothesis have also been demonstrated by authors such as Castanias and DeAngelo (1981) and Bradley, Jarrell, and Kim (1984).

The basic model underlying these papers was first introduced by Leland (1994), who was able to develop closed-form solutions for the value of debt and for optimal corporate capital structure. His results indicate that a rise in the risk-free interest rate (increasing the cost of debt financing) leads to a greater optimal debt level. Increasing risk transfers value from bondholders to stockholders when debt is unprotected, leading cautious bondholders to demand higher
interest rates even when the firm currently has low risk. But such costs typically are not incurred when firms issue protected debt. Protected debt may be the preferred form of financing in these situations.

One limitation of Leland’s model is that it solves for the firm’s optimally-levered value, given that interest rates are constant and that the firm issues exclusively infinite maturity debt. Leland and Toft (1996) extend Leland’s (1994) closed-form results to a much richer class of possible debt structures and permit the study of the optimal maturity of debt as well as the optimal amount of debt. They show that optimal leverage depends upon debt maturity, and it is noticeably lower when the firm is financed by shorter-term debt.

The fact that longer-term debt generates higher firm value poses the question of why firms issue short-term debt. One answer to this question, some authors contend, is that short-term debt reduces agency costs. Also, in the presence of agency costs, it is shown that riskier firms should issue shorter term debt in addition to using less debt. Using Leland’s (1994) model, Ross (1997) shows that hedging a firm’s assets can result in an enhanced optimal capital structure that is worth an extra 10 to 15 percent for current shareholders.

Cross-sectional leverage studies typically employ measures of earnings’ variability as proxies for risk in unlevered firms, and these studies also implicitly assume that, aside from mean and variance, earnings processes are homogeneous across firms. Raymar (1991) suggests that such measures may be empirically inappropriate. Under the assumption that earnings follow an autoregressive process, Raymar argues that firm value and leverage vary optimally through time and increase with earnings. The model’s primary implication is that the greater serial correlation can induce larger than average variability in firm value. This larger variability results in lower optimal leverage.
When earnings are low, a firm optimally would reduce its leverage ratio and debt level. In practice, however, leverage is typically observed to increase during recessions. This phenomenon might be explained by increased agency and informational costs at such times.

Although derivatives offer only one means for managing risk among many others, the relatively low transactions costs of engaging in derivatives programs make this an ideal setting for researchers to study corporate hedging practices and objectives. One study by Graham and Rogers (2002) finds evidence that firms do hedge in order to increase debt capacity and interest deductions. This implies that a complete modeling of corporate debt policy should control for the influence of hedging decisions. Failure to do so can result in serious econometrics problems in any regression analysis with leverage as a dependent variable.

*Other determinants of capital structure*

The literature on capital structure offers other factors that may affect it. These factors are profitability, asset structure, growth, abnormal returns, national patterns and macroeconomic factors, size, and ownership patterns.

**Profitability**

As shown in Myers (1984) and Myers and Majluf (1984), because of information asymmetry in the financial market place, firms prefer to finance their projects first by the retained earnings, second by debt, and last by equity. This suggests that past profitability, and, consequently, the amount of retained earnings available to a firm are important factors in its financings decisions. Myers (1993) shows that the most profitable companies borrow the least.

**Asset structure**

Empirical studies agree that there are some industry patterns in capital structure. Mining companies, public accounting firms, and service firms have a low debt-to-equity ratio, while
utilities, steel companies, and transportation companies carry high leverage. Titman (1984) suggests a liquidation reason for the capital structure industry patterns. Manufacturing companies, for example, should carry less debt because of costly liquidation.

Growth

Under the agency theory, shareholders try to expropriate wealth from bondholders by investing sub-optimally. Green (1984) and Smith and Warner (1979) argue that convertible debt may be positively related to growth opportunities. The reason behind this relationship is that the use of convertible debt reduces agency costs between equity holders and bondholders.

Abnormal returns

Research clearly shows that the stock market reacts positively to a debt increasing issue, and negatively to a leverage decreasing issue. Stock prices rise in response to debt issues—more so when firms contract bank loans, as shown by James (1987)—and drop in response to seasoned equity offerings as well as in response to equity-for-debt exchange offer.

National patterns and macroeconomic factors

There appears to be a relationship between debt ratios and the firm’s country of origin. Different countries have different leverage ratios because of historical, institutional, or cultural factors. At the aggregate level, Rajan and Zingales (1995) show that some factors affecting the leverage rate are the tax code, bankruptcy laws, patterns of ownership, and banks vs. market-based countries.

One of the most recent studies in this area was conducted by Korajczyk and Levy (2002). They split their sample based on a measure of financial constraints and found that target leverage is counter-cyclical for the relatively unconstrained sample, but pro-cyclical for the relatively
constrained sample. The choice of what type of security to issue/repurchase is significantly related to deviations from the target capital structure, particularly for the constrained sample.

Other results suggest that macroeconomic conditions are significant for issue choice for unconstrained firms but less so for constrained firms. These results support the hypothesis that only unconstrained firms are able to time their issue choice to periods when macroeconomic conditions are favorable, while constrained firms take what they can get.

Size

Size is also shown to be a major factor determining the capital structure. Relatively large firms tend to be more diversified and less prone to bankruptcy. Furthermore, the cost of issuing debt and equity securities is also related to firm size. Smith (1977) suggests that because small firms pay much more than large firms to issue new equity, and also somewhat more to issue long-term debt, small firms may be more leveraged than larger ones. Small firms may also prefer to borrow short-term (through bank loans) rather than issue long-term debt because of the lower fixed costs associated with this alternative.

Ownership Patterns

Some research points to the fact that there is a relationship between ownership patterns and leverage ratio. Most of the authors agree that concentrated firms tend to support more debt than similar public firms. However, Friend and Lang (1988) document that family-owned firms are much more likely to be all-equity financed than are non-family-owned companies.

Market Timing Theory of Capital Structure

The idea of market timing evolved after the work of Loughran and Ritter (1995), and Spiess and Affleck-Graves (1995), who found that firms experience long-term underperformance after equity issues.
Loughran and Ritter (1995) find that the average annual return during the five years after issuing is only 7 percent for firms conducting seasoned equity offerings. Investing an equal amount at the same time in a non-issuing firm with approximately the same market capitalization, and holding it for an identical period, would have produced an average compound return of 15 percent.

Spiess and Affleck-Graves (1995) suggest that managers take advantage of overvaluation in both the initial and seasoned equity offering markets. Firms making seasoned equity offerings underperform a sample of matched firms from the same industry and of similar size that did not issue equity. Stein (1996) gives support to these findings, and shows that managers can time the market to maximize existing shareholders wealth. Mispricing and market under/over reaction to equity issues lead managers to actively seek to benefit from market timing.

Moreover, Baker and Wurgler (2000) show that the share of equity issues in total new equity and debt issues is a strong predictor of U.S. stock market returns between 1928 and 1997. They argue that when equity prices are too high, existing shareholders benefit by issuing overvalued equity, and when equity prices are too low, issuing debt is preferable. Consequently with this timing hypothesis, firms issuing equity have poor subsequent performance.

However, when comparing the ability of agency models, pecking order, and timing models to explain firms’ decisions to issue equity or debt, Jung, Kim, and Stulz (1996) fail to find support for the timing theory; rather, they find strong support for the agency model.

The first expansion of the market timing theory to capital structure is proposed by Baker and Wurgler (2002) (BW). The theory they present states that “capital structure evolves as the cumulative outcome of past attempts to time the equity market.” The authors use Rajan and Zingales’s (1995) and Fama and French’s (2002) determinants of capital structure to test for
market timing hypothesis. Rajan and Zingales’ (1995) determinants of capital structure are market-to-book, profitability, firm size, and asset tangibility. BW use also four more variables used in Fama and French’s (2002) study of capital structure determinants. These variables include two measures of dividends, a measure of depreciation, and a measure of research and development.

The variable of interest in the BW study is the market-to-book value of assets, which can be regarded as a measure of investment opportunities. Hittle and Haddad (1992) suggest that market-to-book value provides an indication of asymmetric information. When market values are different than book values, due to growth opportunities, information asymmetry is likely to increase.

The authors find a negative relationship between market-to-book in year $t-1$ and leverage in year $t$. High values of market-to-book are associated with less leverage, and low market-to-book values are associated with higher ratios of debt-to-total assets.

A new variable that is supposed to summarize the historical variation in market valuations is added to the other determinants of capital structure. This “external finance weighted-average” market-to-book ratio, for a given year-firm, is defined as follows:

$$
\left( \frac{M}{B} \right)_{\text{efwa}, t-1} = \sum_{s=0}^{t-1} \sum_{r=0}^{t-1} e_s + d_s \cdot \left( \frac{M}{B} \right)_s
$$

Where the summations are taken starting either at the IPO year, or from the first year of available Compustat data, and $e$ and $d$ denote net equity and net debt issues, respectively. The “external finance weighted-average” is economically and statistically significant when used in a multivariate regression with leverage as the dependent variable. It is so, even when the one period lagged market-to-book is included in the regression. The historical value is stronger and
more consistent. A test of persistence shows that the historical influence of market-to-book lasts for at least ten years.

Jenter (2003) provides more evidence of market timing both at the corporate and management level. Managers in low market-to-book firms purchase equity on their own, and repurchase for their firms. Market timing shows up in managers’ own portfolios, as well as in the firm’s financing decisions. In Jenter’s analysis, also, market inefficiency is not implied. Here again, managers are said to be overconfident in their ability to value their firms better than outside investors can. High market-to-book firms are regarded as growth firms and low market-to-book firms are regarded as value firms. Managers tend to purchase equity in value firms and tend to sell in growth firms.

Jenter goes further in this analysis and states that managers may issue equity only to profit from the believed mispricing, not because of a growth opportunity or a need for funds. Negative net present values projects may be undertaken only because equity is believed to be cheap, and positive net present values forgone only because funding is believed to be expensive.

Korajczyk and Levy (2003) show that firms, especially financially unconstrained ones, time their issues to coincide with periods of favorable macroeconomic conditions. The criteria for a firm to be labeled financially constrained are: (1) the firm does not have a net repurchase of debt or equity and does not pay dividends within the event window, and (2) the firm’s Tobin’s Q, defined as the sum of the market value of equity and the book value of debt, divided by the book value of assets, at the end of the event quarter should be greater than one. Otherwise, a firm-window is labeled financially unconstrained.

Leverage of firms in the financially unconstrained sample is shown by Korajczyk and Levy (2003) to vary counter-cyclically with macroeconomic conditions. The macroeconomic
conditions account for 12% to 51% of the time-series variation in these firms’ leverage. Meanwhile, firms in the financially constrained sample are found to have pro-cyclical leverage, with macroeconomic conditions accounting for 4% to 41% of the time series variation.

BW conclude that capital structure is just the cumulative outcome of past attempts to time the market. However, the authors were not able to definitely discriminate between the two versions of market timing.

The perceived mispricing version states that managers will issue equity when they think that its cost is irrationally low and repurchase when they think the cost is irrationally high. This version implies irrational managers and/or investors, and time-varying mispricing. Managers act as technical analysts and think they can time equity issuance even though market may still be efficient.

Asquith and Mullins (1986) and Korajczyk, Lucas, and McDonald (1991) show that companies tend to issue equity following unusually large increases in their stock prices, and they abstain from issuing new equity in times of falling stock prices. Asquith and Mullins (1986) show that there is a price run-up preceding equity issues. They report that issues of seasoned equity are interpreted as bad news by investors, with negative announcement date effects on equity prices. This result is predicted by the three capital structure models: pecking order, agency costs, and timing models. Moreover, the results are industry specific mainly because of different levels of information asymmetry.

The second version of market timing is the adverse selection version. The next section surveys the literature on the effect of adverse selection on financing decisions and market timing.
Financing Decisions and Adverse Selection

One of the main issues in the financial market place is that one party does not know enough about the other party to be able to engage in transactions with it. This information asymmetry problem was first studied by Akerlof (1970), who was able to relate quality and uncertainty. The basic idea is that there are many markets in which buyers use some market statistic to judge the quality of prospective purchases. In this case there is incentive for sellers to market poor quality merchandise, since the returns for good quality accrue mainly to the entire group whose statistic is affected rather than to the individual seller. As a result, there tends to be a reduction in the average quality of goods and also in the size of the market.

There are two problems created by asymmetric information; adverse selection and moral hazard. Adverse selection problems arise before the transaction occurs. For example, investors with bad credit would seek out loans at any price (market for lemons). In the case of moral hazard, after the transaction occurs, the lender faces the risk that the investor will not use the funds for the intended purpose. The market can collapse if the lenders, because of the fear of adverse selection or moral hazard problems, decide not to give loans at all.

The Modigliani-Miller theorem on the irrelevancy of capital structure implicitly assumes information symmetry. However, Ross (1977) shows that if managers possess inside information, the choice of managerial financial structure signals information to the market. The value of firms is argued to rise with leverage, since increasing leverage increases the market’s perception of value.

In Myers and Majluf (1984), managers are supposed to know, better than anyone else, the profit opportunities of their firm. Investors are well aware of this, and they require more return on their investments than managers are willing to offer. Because managers are supposed to act in
the best interests of existing shareholders, an equity issue tends to signal that managers suspect profit opportunities to be risky or not good, and they intend to have outside investors share this risk. A debt issue, on the other hand, signals managers’ confidence about expected cash flow and their ability to pay back fixed interest amounts. Asymmetric information is the key. Myers and Majluf point to the underinvestment problem that can arise when managers forego investment opportunities when they believe that equity is undervalued.

A dynamic version of Myers and Majluf (1984) assumes time varying adverse selection. Choe, Masulis, and Nanda (1993) show that firms tend to issue seasoned equity when they face lower adverse selection costs. This occurs in periods of more promising investment opportunities and less uncertainty about assets in place. Studies by Lucas and MacDonald (1990) and Korajczyk, Lucas, and McDonald (1992) examine adverse selection that varies across firms. The decision to issue equity depends on the degree of managers’ private information and, ultimately, on their willingness to postpone issues until the private information becomes public.

Kester (1986) and Chari, Jagannathan, and Ofer (1988) show that information asymmetry varies with firm size. Larger firms have less asymmetric information than smaller ones. Also Lin and Howe (1990) argue that because smaller firms are not monitored by financial analysts as larger firms are, information asymmetry is greater in smaller firms.

The choice a firm makes between financing its investments with equity or debt depends on several variables including how informed investors are about the firm and its earnings prospects. Gennotte (1986) argues that when selecting their optimal portfolio, investors use all available information in forming expectations. Under adverse selection, a firm issues debt when less information is available to the public. The firm may conceive that the investor who does not have enough information is not likely to take risks with its stocks, and hence is more willing to
accept less return for less risk by buying debt. How informed an investor is determines ultimately what type of securities he or she is willing to buy.

The return on equity is more variable and more sensitive to information than fixed return debt. Firms that issue debt benefit from low cost funds. Those that issue stocks, benefit from risk sharing. Veronesi (2000), who investigates the relationship between the precision of public information about economic growth and stock market returns, finds that higher precision of signals tends to increase the risk premium. Researchers use several methods to account for adverse selection since no one method is agreed upon to capture information asymmetry.

Authors such as Dierkens (1991) relate information asymmetry to two main factors: uncertainty about the firm in terms of variance of returns and the information related measures such as public announcements.

The problem of adverse selection can make firms lean towards more convertible debt financing. Stein (1992) explains that issuing convertible debt gives a firm more latitude towards issuing more debt if needed. A firm issues convertibles, with a call provision, so that it could force conversion to equity when information is revealed before debt maturity. The objective is to avoid problems associated with adverse selection.

A test of managers’ ability to time the market is provided by Kahle (2000). By studying insider trading around periods of new equity issues, the author is able to show that insiders’ ownership changes prior to equity and convertible debt issuance. Kahle (2000) finds that in the six months prior to convertible debt and equity issues (information revealing securities), insider sales increase (and purchases decrease). Insider trading is also positively related to stock price run-up and market-to-book ratios. Moreover, Kahle finds a negative relationship between abnormal insiders selling and long-run performance for equity issues, and he finds a positive
relationship between abnormal purchases and long-run performance for straight debt issues. The
author suggests that these results are consistent with managers timing equity issue as well as
their personal trades.

Bayless and Chaplinsky (1996) show that managers time equity issues in terms of the
market level of information asymmetry. It is suggested that there exist windows of opportunity
for equity issues resulting from periods of reduced information asymmetry. Contrary to other
studies (Choe, Masulis, and Nanda (1993)) that base the selection criteria of issue conditions on
macroeconomic variables, Bayless and Chaplinsky use the aggregate volume of equity issues as
a determinant of issue conditions. They rank a three-month moving average of equity issue
volume into quartiles. They define “HOT” issue periods as at least three contiguous months
when equity volume exceeds the upper quartile. “COLD” issue periods are defined as at least
three contiguous months when issue volume falls below the lower quartile. “NORMAL” issue
periods fall between the upper and lower periods. Bayless and Chaplinsky find hot markets offer
favorable conditions for issues that are independent of macroeconomic and market conditions.
Furthermore, the price reaction to equity issues becomes less negative at a decreasing rate as
issue volume increases. The difference in price reactions between hot and cold markets is highly
economically significant. Bayless and Chaplinsky conclude that time varying asymmetric
information is one of the major concerns of investors when deciding to invest in times of hot or
cold issue markets.

Table 1 summarizes the literature review section with regard to optimal capital structure
and information asymmetry.
Table 1: Optimal Capital Structure Theory and Information Asymmetry

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Baker and Wurgler (2002) (BW) theorize that managers time the market when they issue equity or debt. They argue that the choice between these two types of financing is linked in important ways to the ratio of the market to the book value of assets. However, BW state that market-to-book can be a proxy for both the motives of managers’ perceptions of stock under-/over-valuation and adverse selection as explanations of market timing.

BW argue that even if market-to-book measures managers’ perceptions of stock valuation, this does not mean that the market is inefficient. The market can still be efficient while managers “think” they can time their issues. High, by historical standards, market-to-book constitutes a signal to managers of a good opportunity to issue equity instead of debt. Low market-to-book leads to more debt issues. Therefore, market-to-book is expected to have a negative relationship with leverage.

The second argument of this market timing theory comes from a dynamic model of Myers and Majluf (1984), in which adverse selection varies across time or firms, and managers and investors are rational. BW argue that since lower adverse selection is related to higher market valuation of assets compared to book values, low adverse selection leads to more equity financing. Bayless and Chaplinsky (1996) show that equity issues happen most often in periods of smaller announcements effects. Korajczyk, Lucas, and McDonald (1991) find that a firm prefers to issue equity when the market is most informed about its earnings prospects. According
to the dynamic adverse selection model, market-to-book is also expected to have a negative relationship with leverage.

BW find that market-to-book is not only related to the short-term choice of financing, but it has also a long-term effect. A lag of ten years in the market-to-book ratio is found to be statistically significant when regressed on leverage. BW contend that “capital structure evolves as the cumulative outcome of past attempts to time the equity market.”

However, the BW study is not able to determine whether the cumulative effect of market timing on capital structure is primarily due to the motive of perceived mispricing or to the motive of adverse selection. Next, I shall use an alternative timing measure, the level of insider trading, to test the validity of BW’s theory. I shall develop a modified version of the BW methodology to examine the short- and long-term effects of insider trading on market timing. My goal is to determine whether adverse selection or perceived mispricing is the main motive behind the equity market timing theory.

Hypothesis 1

The level of insider trading, as well as the market-to-book used by BW, can be used to test for the market timing theory of capital structure. Kahle (2000) finds that in the six months prior to convertible debt and equity issues, insider sales increase and purchases decrease. By studying insider trading around periods of new equity issues, Kahle is able to show that insiders’ ownership changes prior to equity and convertible debt issuance. The author suggests that these results are consistent with the managers timing equity issue as well as their personal trades.

Agrawal and Mandelker (1987) suggest that the security holdings of managers of firms with a debt-equity ratio that increases are larger than those for which this ratio decreases. Also,
consistent with the predictions of agency theory, Mehran (1992) finds a positive relationship between the firm’s leverage ratio and the percentage of managers’ owned equity. Therefore, insider trading, more specifically insider selling, can be used as another measure to test for equity market timing and capital structure. Under the perceived mispricing motive, this implies that managers think they can time equity issuance using technical analysis. On the other hand, managers may also time the equity issues based on inside information. Insiders sell parts of their ownership prior to equity issues if, based on technical analysis, they think the firm is over-valued, or if they actually have negative inside information about the earnings prospects. Inside information gives insiders incentives to increase their holdings of undervalued firms and decrease their holdings of overvalued firms; hence, equity issues based on market timing should be accompanied by increased insiders selling.

Hypothesis 1: There is a negative relationship between the change in leverage and net insider selling.

Hypothesis 1A: There is no or a positive relationship between the change in leverage and net insider selling.

Hypothesis 2

Hypothesis 2: There is a positive correlation between market-to-book and net insider selling.

Hypothesis 2A: There is no or a negative correlation between market-to-book and net insider selling.

Hypothesis 3

Once the short-term relationship between net insider selling and the change in leverage is tested, net insider selling’s long-term relationship with capital structure can be also tested. The following hypothesis is a modified version of BW’s theory that tests net insider selling as a measure of equity market timing.

Hypothesis 3: There is a negative relationship between the debt ratio and historical levels of net insider selling.

Hypothesis 3A: There is no or a positive relationship between the debt ratio and historical levels of net insider selling.

Hypothesis 4

Managers can issue equity for two reasons. The first is that they actually need external financing at a time when the stock price is “exceptionally” high, and/or the level of information asymmetry is exceptionally low. This makes equity issue an attractive decision over debt issue. The second reason for an equity issuance is that managers think they can profit from this situation, as their perceived abnormally overvalued firm may experience low growth opportunities in the future, or because of information asymmetries between insiders and outsiders. In this case the main objective behind the issue is not to finance a project, but to benefit from a special situation in the market place. Under the perceived mispricing version, and based on technical analysis, the stock price is supposed to have reached a peak that would be followed by a price drop. Under the dynamic adverse selection version, managers issue equity in
times of low information asymmetry. Managers could also be aware of negative inside
information that makes the benefit from equity issues outweigh the negative signal that
accompanies it.

Perceived mispricing

If the perceived mispricing version is the main reason behind market timing’s influence
on capital structure, we should expect a negative relationship between the debt ratio and
perceived levels of overvaluation. If managers feel that there is a price run-up, they would try to
time the market and issue equity. If, on the other hand, managers feel that the stock is abnormally
undervalued, they would buy back stocks, or at least postpone any equity offerings (Lucas and
McDonald, 1990). Most interestingly, the accumulation over time of these decisions by
managers to issue (or not) equity should have an influence on capital structure.

Under the perceived mispricing model, the decision to issue or buyback stocks is based
solely on managers’ beliefs of mispricing. It does not have to be correlated with the company’s
operating earnings, which reflects fundamentals of the company. The overvaluation referred to
here comes mainly from a technical analysis perspective. Managers are looking for unusual price
changes, not price changes due to regular business. Stated differently, the hypothesis is that
managers are technical analysts, and capital structure is affected by their technical analysis-based
market timing.

Adverse selection

Dynamic adverse selection model

In the dynamic version of Myers and Majluf (1984), adverse selection varies over time or
across companies. If the adverse selection version is the main component in the relationship
between equity market timing and capital structure, we should expect the debt ratio to be related
to levels of information asymmetry. The timing and adverse selection of interest here are company specific. The hypothesis is that managers issue equity when their company’s level of information asymmetry is low.

For adverse selection to be the reason behind the equity market timing, the dynamic version should imply that companies are more likely to issue equity in times of low information asymmetry, compared to periods of high information asymmetry. Even if managers have negative inside information, they are not likely to issue equity because investors would be reluctant to buy stocks when information asymmetry is high. If the company decides to issue, the price discount will be higher than it would be in times of low information asymmetry. Korajczyk, Lucas, and McDonald (1991) show that when equity issue more closely follows an information release, the fall in stock price is expected to be smaller.

Naïve adverse selection model

However, if managers have inside information, they will have an incentive to sell equity when they “know” that it is overvalued. For managers to issue equity in this case, the inside information that they have should outweigh the negative signal that usually accompanies equity issues. I term this the naïve adverse selection version. Managers are not timing the levels of information asymmetry; they only issue equity when the benefit from the inside information based overvaluation is expected to be higher than the price discount that follows the issue.

Under the equity market timing theory, the accumulation of adverse selection based equity issues over time should influence capital structure. Similar to the mispricing theory, it also assumes that managers do not rebalance to optimal levels of debt after timing the market.

positively related to stock price run-up and market-to-book ratios. Moreover, Kahle (2000) finds a negative relationship between abnormal insiders’ selling and long-run performance for equity issues, and a positive relationship between abnormal purchases and long-run performance for straight debt issues. The author suggests that these results are consistent with managers timing equity issue as well as their personal trades. However, Lee (1997) finds no support for any difference in long-term stock performance between firms that issue equity simultaneously with insider selling or insider buying.

The evidence on post-issuance and insider trading are mixed. Jenter (2003) suggests that managers in low market-to-book firms purchase equity on their own and repurchase for their firms. Market timing shows up in managers’ own portfolios, as well as in the firm’s financing decisions. Compared to outside investors, managers are more confident in their ability to value their firms. They tend to purchase equity in value firms and tend to sell in growth firms. Jenter also states that managers may issue equity only to profit from the believed mispricing, not because of a growth opportunity or a need for funds. Negative net present value projects may be undertaken only because equity is believed to be cheap, and positive net present values forgone only because funding is believed to be expensive.

Depending on which motive of the equity market timing is valid, subsequent returns, following simultaneous equity issues and insiders’ trading, may vary. Under the perceived mispricing version, managers are technical analysts, and they time the equity market based on technical tools. In this case, and when managers are net sellers and issue equity, we expect the subsequent company returns to vary depending on the accuracy of their forecasts.

Under the naïve adverse selection explanation, managers do have inside information and act based on it; therefore, when managers are net sellers in equity issuing companies, we expect a
100% valid forecast of negative subsequent returns. On the other hand, net buying insiders in non-issuing firms would predict positive subsequent returns.

**Hypothesis 4:** The adverse selection motive of the equity market timing predicts a positive correlation between the change in leverage and subsequent performance, for companies that issue equity and are net insider sellers.

**Hypothesis 4A:** There is no or a negative correlation between the change in leverage and subsequent performance, for companies that issue equity and are net insider sellers.

**Hypothesis 5**

A positive correlation between the change in leverage and subsequent performance for companies that issue equity and are net insider sellers means that these companies’ timing of equity issues is based on adverse selection. The next hypothesis takes this relationship to the long term.

**Hypothesis 5:** Any negative relationship between the debt ratio and the historical levels of net insider selling is driven by adverse selection market timing.

**Hypothesis 5A:** Any negative relationship between the debt ratio and the historical levels of net insider selling is not driven by adverse selection market timing.

**Hypothesis 6**

To be able to test the adverse selection version of the timing theory we should be able to measure adverse selection. Adverse selection is supposed to vary across time or across firms. Among several methods used to measure adverse selection, two are widely used. The first method uses close-to-offer returns, and the second one uses the bid-ask spread. I use close-to-offer returns, as Corwin (2003) shows that seasoned offerings are more underpriced for firms
with high price uncertainty and asymmetric information. Two methods for extracting the adverse selection component of the bid-ask spread are also used.

The bid-ask spread is a gross proxy for information asymmetry. The theory states that the spread is a combination of order processing costs, inventory holding costs, and adverse information costs. The adverse information cost has been argued to represent 43 percent and 6.9 percent of the total spread, respectively, in Stoll (1989) and Huang and Stoll (1997). Since I am only interested in the adverse information part of the bid-ask spread, I extract this component from the total spread, and test its correlation with the debt ratio. Here again, there is no consensus among researchers on how to extract this component from the bid-ask spread. Since there are several theories available, I use one generally accepted method ($\lambda$), and I shall introduce a new empirical method (R-square) to extract adverse selection from the spread (see the methodology chapter). I expect $\lambda$ and R-square to be negatively correlated.

Hypothesis 6: There is a negative correlation between $\lambda$ and R-square.

Hypothesis 6A: There is no or a positive correlation between $\lambda$ and R-square.

Hypothesis 7

Before testing the long-term relationship between leverage and historical levels of adverse selection, I test the correlation between market-to-book (BW measure of market timing) and the two measures of the adverse selection components of the bid-ask spread. To be consistent with BW hypothesis on the adverse selection version of the market timing, market-to-book should be negatively correlated with information asymmetry. Hence, the following correlations with each one of the adverse selection measures should be expected.
Hypothesis 7: There is a positive correlation between market-to-book and R-square, and a negative correlation between market-to-book and $\lambda$.

Hypothesis 7A: There is no or a negative correlation between market-to-book and R-square, and no or a positive correlation between market-to-book and $\lambda$.

Hypothesis 8

One of the objectives of this study is to test whether capital structure is an accumulation of managers’ decisions, over time, to issue equity, conditional on the levels of information asymmetry. However, a test of the existence of a short-term relationship is needed first. Choe, Masulis, and Nanda (1993) show that firms tend to issue seasoned equity when they face lower adverse selection costs. Studies by Lucas and MacDonald (1990) and Korajczyk, Lucas, and McDonald (1992) examine adverse selection that varies across firms. The choice a firm makes between financing its investments with equity or debt depends on several variables including how high the level of information asymmetry is. For adverse selection to be the main motive underlying the market timing theory, the relationship in hypothesis 8 should exist.

Hypothesis 8: There is a positive relationship between the change in leverage and existing level of adverse selection.

Hypothesis 8A: There is no or a negative relationship between the change in leverage and existing level of adverse selection.

Hypothesis 9

Before testing the long-term relationship between adverse selection and capital structure, we need to test if the short-term correlation tested above comes mainly from equity issues, as market timing implies.
Hypothesis 9: Any positive relationship between the change in leverage and measures of adverse selection is driven by equity issues.

Hypothesis 9A: Any positive relationship between the change in leverage and measures of adverse selection is not driven by equity issues.

Hypothesis 10

Close-to-offer returns

The underpricing of seasoned equity offerings was first documented by Smith (1977). More recently, Corwin (2003) shows that, during the 1980s and 1990s, seasoned offers were underpriced by an average of 2.2 percent. I use the close-to-offer returns and other measures to differentiate between information-based and non-information-based equity issues. Corwin (2003) argues that seasoned offerings are more underpriced for firms with high price uncertainty and asymmetric information. Firms have to offer higher price discounts to investors when the equity is issued in times of high information asymmetry.

Hypothesis 10 formally tests whether the dynamic adverse selection model is the main motive underlying the equity market timing theory.

Hypothesis 10: There is a positive relationship between the debt ratio and historical levels of adverse selection.

Hypothesis 10A: There is no or a negative relationship between the debt ratio and historical levels of adverse selection.

Hypothesis 11

Kester (1986) and Chari, Jagannathan, and Ofer (1988) show that information asymmetry varies with firm size. The degree of asymmetric information is higher for small firms. Also Lin
and Howe (1990) argue that because smaller firms are not as monitored by financial analysts as larger firms are, information asymmetry is greater in smaller firms.

Since information asymmetry varies with size, and smaller firms have higher information asymmetry, the degree of equity market timing is expected to be higher in small firms.

Hypothesis 11: Any positive relationship between the debt ratio and historical levels adverse information is more significant for small companies.

Hypothesis 11A: Any positive relationship between the debt ratio and historical levels adverse information is not related to firm size.
DATA AND RESEARCH METHODOLOGY

Data and Summary Statistics

The sample comes from Standard & Poor’s COMPUSTAT® (North America) and covers the period 1987-2001. I use the same definition for book leverage, as in Baker and Wurgler (2002), who also follow Fama and French (2000) definitions. Book value leverage is book debt to assets. Market value leverage is book debt divided by the result of book assets minus book equity plus market equity. Equity issues are defined as the change in book equity, minus the change in retained earnings, divided by assets. Newly retained earnings are defined as the change in retained earnings divided by assets. Debt issues are defined as the residual change in assets divided by assets.

The sample is restricted to firms with a minimum book value of assets of $10 million. It also excludes financial firms and firm-year outliers. Table 3 shows a decrease in both leverage and internal finance and an increase in equity issues, over time. The increase in equity issues is mostly a phenomenon of the 1990s, and it is suggestive of market timing for BW. We can also see a steady increase in the size of the sample. When the bid-ask spread data are used, the sample consists of firms from Compustat for which I could match the data with the bid and ask prices, closing price, and transactions volume from CRSP.

Insider trading and holdings data come from the Ownership Reporting System (ORS) tapes. I analyze both open-market and private transactions, and examine trades by company executives, officers, directors, and controlling persons. To reduce any bias due to tax loss selling
effect, I omit from the insider selling and holdings sample the transactions that occurred in December and January.

Information on monthly returns is obtained from CRSP. The equity issues data come from the SEC’s Registrations and Offering Statistics (ROS) data tapes. The ROS data used to test hypothesis 4 cover the period 1983-1988. The SEC stopped making this data available after 1988. The sample of security issues satisfies the following criteria:

- The security issue is not a combination of different classes of securities;
- The issue is not a shelf registration or rights offering;
- Security returns must be available from CRSP.

Table 4 shows the frequency distribution of security offerings in the sample subject to the issuance screens. Financial firms are also excluded. The final sample contains 779 equity issues between 1983 and 1988 that satisfy the above criteria.

Research Methodology

Testing Hypothesis 1

*Hypothesis 1: There is a negative relationship between the change in leverage and net insider selling.*

Net insider selling is the yearly difference between insider selling and insider purchasing. To capture only the abnormal variation in insider trading, net insider selling is weighed by trading volume. The following regression tests the short-term relationship between the change in leverage and net insider selling:

\[
\left( \frac{D}{A} \right)_t - \left( \frac{D}{A} \right)_{t-1} = \alpha + \beta_1 \left( \frac{Net.\,Ins.\,Sell}{Trad.\,Vol.} \right)_t + \beta_2 \left( \frac{M}{B} \right)_{t-1} + \beta_3 \left( \frac{PPE}{A} \right)_{t-1} \\
+ \beta_4 \left( \frac{EBITDA}{A} \right)_{t-1} + \beta_5 \ln(S)_{t-1} + \beta_6 \left( \frac{D}{A} \right)_{t-1} + \varepsilon_t
\]
The change in leverage is regressed on the value in year $t$ of the level of net insider selling, and year $t-1$ of market-to-book, asset tangibility, profitability, and size. The last variable, lagged leverage, is a control variable necessary in our regression since leverage values are bounded between zero and one. If the leverage is near zero or one, it could only change in one direction, regardless of the variation of the independent variables. Failing to consider that can create problems in interpreting the effects of the other variables.

The control variables in our regression analysis are Rajan and Zingales (1995) determinants of capital structure, where:

- **Asset tangibility**: defined as net plant, property, and equipment divided by total assets and expressed in percentage terms $\left( \frac{PPE}{A} \right)$. A positive correlation is expected because tangible assets may be used as collateral.

- **Profitability**: defined as earnings before interest, taxes, and depreciation divided by total assets and expressed in percentage terms $\left( \frac{EBITDA}{A} \right)$. A negative correlation is expected under the pecking order theory.

- **Size**: measured as the log of net sales $\ln(S)$. A positive correlation is expected since size is a proxy for lower probability of default.

The variable of interest in this test is net insider selling. Since insider selling is correlated with equity issues, I expect a negative correlation with debt ratio. More interestingly, I want to test if the coefficient on market-to-book is still statistically significant with the inclusion of net insider selling in the regression. Other reasons, such as a need for cash, portfolio rebalancing, or
tax loss selling\(^1\) may also lie behind insiders selling decisions. In the long-term relationship with capital structure test, net insider selling is weighed by security issues.

Testing Hypothesis 2

_hypothesis 2: There is a positive correlation between market to book and net insider selling._

I test the correlation between market-to-book and net insider selling using the Pearson’s correlation coefficient. Cross-sectional correlation is measured between market-to-book and net insider trading for all the firms in the sample. The Pearson correlation coefficient measures the strength and direction of a linear relationship between two variables. Pearson's \(r\) values can range between -1 to +1. A correlation coefficient of +1 signifies a perfect positive relationship, while -1 shows a perfect negative relationship. I expect to find a positive correlation between these two variables\(^2\), which means that the equity market timing theory can be retested using net insider selling instead of market-to-book.

Testing Hypothesis 3

_hypothesis 3: There is a negative relationship between the debt ratio and historical levels of net insider selling._

As in Baker and Wurgler (2002), I use the “external finance weighted-average” but this time, the weighting is based on net insider selling instead of market-to-book. These variables are defined as follows:

\[
\left( \frac{M}{B} \right)_{efwa,t-1} = \sum_{s=0}^{t-1} \frac{e_s + d_s}{s} \cdot \left( \frac{M}{B} \right)_{s,t}.
\]

\(^1\)To remedy to the tax loss selling effect, we propose to omit from our sample of insider selling, the transactions that occurred in December and January.

\(^2\)Insider selling can also influence market to book negatively. However I expect the positive correlation to overcome the negative one. The effect of price runups on insider selling is higher than the effect of insider selling on price discount.
Following BW methodology, I construct these variables so that they take high values for firms that raised external finance when the net insider selling was high and vice versa. Net equity issues \( e \) and net debt issues \( d \) are defined, respectively, as the change in book equity minus the change in balance sheet retained earning, and the change in book debt.

These weighted-average variables are used in the following regression:

\[
\left( \frac{D}{A} \right)_t = \alpha + \beta_1 \left( \frac{Net.Ins.Sell}{Trad.Vol.} \right)_{efw, t} + \beta_2 \left( \frac{M}{B} \right)_{efw, t-1} + \beta_3 \left( \frac{Net.Ins.Sell}{Trad.Vol.} \right)_{efw, t-1} + \beta_4 \left( \frac{PPE}{A} \right)_{t-1} + \beta_5 \left( \frac{EBITDA}{A} \right)_{t-1} + \beta_6 \frac{Ln(S)}{t-1} + \varepsilon_t
\]

For a given year \( t \), the debt ratio (book and market leverage) is regressed on the external finance weighted-average measure of net insider selling and market-to-book, on insider selling in year \( t \), and on \( t-1 \) values of market-to-book, asset tangibility, profitability, and size. Net insider trading in year \( t \), as well as the lagged value of market-to-book, are included to control for their contemporaneous relations with the debt ratio. The variable of interest in this test is net insider selling and it is expected to be negatively related to debt ratio.

To test for the determinants of leverage, Rajan and Zingales (1995), BW, and others, after controlling for other related variables, find a negative relation between market-to-book and the debt ratio. After controlling for the same variables, this test should show a negative relation between the debt ratio and historical levels of net insider selling. Thus, a negative sign on the coefficient for the external finance weighted-average net insider selling would give further support to BW’s equity market timing theory of capital structure.
Testing Hypothesis 4

Hypothesis 4: The adverse selection motive of the equity market timing predicts a positive correlation between the change in leverage and subsequent performance, for companies that issue equity and are net insider sellers.

To test hypotheses 4, the sample is divided between equity issuing firms and non-equity issuing firms. The sub-sample of the equity issuing firms is further divided into “net buying” and “net selling” firms. A firm is defined as “net buying,” in a given year, if the yearly difference between insider selling and insider purchasing is negative. A firm is defined as “net selling,” in a given year, if the yearly difference between insider selling and insider purchasing is positive.

I test the correlation between the change in leverage and subsequent performance for companies that issue equity and are net insider sellers, using the Pearson’s correlation coefficient. For equity issuing net insider selling firms, the Pearson correlation coefficient is used between the change in leverage in year $t$, and the subsequent returns measured over twelve months starting in July of year $t+1$. A statistically significant positive correlation between these two variables would show that equity issue decisions, accompanied by insiders selling, are based on information, not technical analysis.

Testing Hypothesis 5

Hypothesis 5: Any negative relationship between the debt ratio and the historical levels of net insider selling is driven by adverse selection market timing.

For this test, a dummy variable is added to equation (4) as follows:

$$
\left( \frac{D}{A} \right)_t = \alpha + \beta_1 \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_{\text{efwa},t} + \beta_2 \text{Dum}_{t} \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_{\text{efwa},t} + \beta_3 \left( \frac{M}{B} \right)_{\text{efwa},t-1} \\
+ \beta_4 \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_{t-1} + \beta_5 \left( \frac{M}{B} \right)_{t-1} + \beta_6 \left( \frac{\text{PPE}}{A} \right)_{t-1} + \beta_7 \left( \frac{\text{EBITDA}}{A} \right)_{t-1} \\
+ \beta_8 \text{Ln}(S)_{t-1} + \varepsilon_t
$$

(5)
Where

\[ D_{\text{dummy}} = \text{dummy variable equal to one for equity issuing, insider selling companies that consistently under performed the control portfolios in the subsequent period, zero otherwise.} \]

Or

\[ D_{\text{dummy}} = \text{dummy variable equal to one for equity issuing, insider selling companies that rank in the lowest two deciles in the subsequent period performance, zero otherwise.} \]

A negative sign for \( \beta_2 \) would indicate that managers do time the equity issues and their timing depends on the inside information they have about earnings prospects.

To further test the mispricing version of the timing theory, we add two dummy variables to equation (4) as follows:

\[
\left( \frac{D}{A} \right)_t = \alpha + \beta_1 \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_{\text{efw},t-1} + \beta_2 \left( \frac{M}{B} \right)_{\text{efw},t-1} + \beta_3 D_{\text{dummy},t-1} \left( \frac{M}{B} \right)_{\text{efw},t-1} \\
+ \beta_4 D_{\text{dummy},t-1} \left( \frac{M}{B} \right)_{\text{efw},t-1} + \beta_5 \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_{t-1} + \beta_6 \left( \frac{M}{B} \right)_{t-1} + \beta_7 \left( \frac{\text{PPE}}{A} \right)_{t-1} \\
+ \beta_8 \left( \frac{\text{EBITDA}}{A} \right)_{t-1} + \beta_9 \text{Ln}(S)_{t-1} + \epsilon_t
\]

Where

\[ D_{\text{dummy}} = \text{dummy variable equal to one for companies whose insiders are net sellers, zero otherwise.} \]

And
\( \text{Dum}_{2,i} = \) dummy variable equal to one for equity issuing, insider selling companies that constantly under performed the control portfolios in the subsequent period, zero otherwise.

A negative sign for \( \beta_3 \) and \( \beta_4 \) would give support to an information based market timing.

**Testing Hypothesis 6**

**Hypothesis 6:** There is a negative correlation between \( \lambda \) and R-square.

Adverse selection component of the bid-ask spread: Model I

The first method for extracting the adverse selection component of the bid-ask spread comes from a modified version of Lin, Sanger, and Booth (1995) model, which is based on the model in Huang and Stoll (1994). Under Lin et al. model, \( \lambda \), in the following regression, represents the portion of the spread due to adverse selection:

\[
Q_{t+1} - Q_t = \lambda z_t + e_{t+1}
\]

Where

\[
Q_t = \frac{Ask_t + Bid_t}{2}, \text{ is the quote midpoint at time } t;
\]

\[
z_t = \text{Price}_t - Q_t, \text{ is the effective half-spread.}
\]

The difference between my model and that of Lin et al. is that I use \( t \) as a measure of daily changes, as opposed to a transaction based timeline in Lin et al. (1995). The use of daily changes is supported in the literature. For example, Foster and Viswanathan (1991) show that adverse selection is the only component of the spread that varies significantly within a day. The other components have little intra- or interday variation. The adverse selection costs are high in the first half hour of trading, fall during the middle of the trading day, and then increase again.
towards the close of trading. Dey and Radhakrishna (2001) use the daily average of effective
spreads across all trades in a day, in Lin et al.’s model, in order to extract the daily adverse
selection and order processing components of the spread.

I extract $\lambda$ from yearly regressions, by firm, using daily changes. $\lambda$, in this case,
measures the firm’s yearly adverse selection. For the daily changes, I use closing numbers for
price, ask, and bid values.

Adverse selection component of the bid-ask spread: Model II

The second method of extracting the adverse selection component of the bid-ask spread
comes from a modified version of Venkatesh and Chiang (1986). $R$-square is computed, yearly,
using daily data, from the following regression model:

$$SPD_t = \alpha + \beta_1 \text{PRICE}_t + \beta_2 \ln(VOL)_t + \beta_3 \text{HL}_t + \epsilon_t,$$

Where

$$SPD_t = \frac{(\text{Ask} - \text{Bid})}{(\text{Ask} + \text{Bid}) \cdot 0.5}$$

is the percentage spread on day $t$;

$\text{PRICE}_t$, the closing price on day $t$, represents the order processing costs;

$\ln(VOL)_t$, the natural logarithm of trading volume on day $t$, represents the holding costs;

and

$$\text{HL}_t = (\text{PRICE}_t - \text{PRICE}_{t-1})^2,$$

is a measure of the price volatility.

In the Venkatesh and Chiang (1986) model, information trading costs, represented by the
intercept term, are constant over time. Their model allows them to test for normal information
asymmetry before earnings and dividend announcements, by using dummy variables for
announcements days, and testing the shift in the intercept. In this model, information trading cost
is not constant, and it is represented by the error term. The only component of the spread not represented by an independent variable, in this regression, is the adverse information costs.

The coefficient of determination, $R$-square, measures the proportionate reduction of total variation associated with the use of the independent variables. As $R$-square increases, the proportion of the spread that is not explained by the independent variables, i.e. adverse selection, decreases and vice versa. I propose to use the $R$-square, for a given firm, to measure the firm’s yearly adverse selection. The use of the $R$-square can present some problems since the independent variables used may not capture exactly and exclusively the other determinants of the spread. Hence, $R$-square may vary not only with information asymmetry, but also with one or more omitted determinants of the spread.

To test the validity of $R$-square as a measure of adverse information, I examine its correlation with $\lambda$.

I test the correlation between $\lambda$ and $R$-square using the Pearson’s correlation coefficient. Cross-sectional correlation is measured between $\lambda$ and $R$-square for all the firms in the sample. I expect to find a negative correlation between $\lambda$ and $R$-square.

Testing Hypothesis 7

$Hypothesis 7$: There is a positive correlation between market-to-book and $R$-square, and a negative correlation between market-to-book and $\lambda$.

The Pearson’s correlation coefficient is used to test for the correlation between market-to-book and each one of the two measures of the adverse selection component of the bid-ask spread to be used in this study. This test should provide some support to the hypothesis that the relation between leverage and market-to-book is mainly due to adverse selection and not to the perceived mispricing version of the market timing theory. It should also allow the identification, among the
two measures of adverse selection, of the one that is more correlated with market-to-book than the other.

**Testing Hypothesis 8**

*Hypothesis 8*: There is a positive relationship between the change in leverage and existing level of adverse selection.

I use $\lambda$ and $R$-square from the spread regression in separate regression models, with the change in the debt ratio as the dependent variable.

$$
\left( \frac{D}{A} \right)_t - \left( \frac{D}{A} \right)_{t-1} = \alpha + \beta_1 (R^2)_{t-1} + \beta_2 \left( \frac{M}{B} \right)_{t-1} + \beta_3 \left( \frac{PPE}{A} \right)_{t-1} + \beta_4 \left( \frac{EBITDA}{A} \right)_{t-1} + \beta_5 \text{Ln}(S)_{t-1} + \beta_6 \left( \frac{D}{A} \right)_{t-1} + \epsilon_t 
$$

$$
\left( \frac{D}{A} \right)_t - \left( \frac{D}{A} \right)_{t-1} = \alpha + \beta_1 (\lambda)_{t-1} + \beta_2 \left( \frac{M}{B} \right)_{t-1} + \beta_3 \left( \frac{PPE}{A} \right)_{t-1} + \beta_4 \left( \frac{EBITDA}{A} \right)_{t-1} + \beta_5 \text{Ln}(S)_{t-1} + \beta_6 \left( \frac{D}{A} \right)_{t-1} + \epsilon_t
$$

Following BW, a negative sign should be expected on the estimated coefficient of $\beta_1$ for $R$-square, and a positive sign on the estimated coefficient of $\beta_1$ for $\lambda$. This means that the debt ratio is positively correlated with one lagged values of adverse selection. It is also interesting to see if the estimated coefficient on market-to-book is still significant with the inclusion of the two measures of adverse selection.

**Testing Hypothesis 9**

*Hypothesis 9*: Any positive relationship between the change in leverage and measures of adverse selection is driven by equity issues.

To conduct this test, the change in leverage is decomposed into net equity issues, newly retained earnings, and the residual change in leverage.
Each component is then regressed on the same independent variables as in the change in leverage (equations 9 and 10). I expect, as with the market-to-book in BW, that the adverse selection measures would be more correlated with net equity issues than with newly retained earnings or the residual change in leverage.

Testing Hypothesis 10

Hypothesis 10: There is a positive relationship between the debt ratio and historical levels of adverse selection.

As was the case with insider selling, I construct the external finance weighted-average $R^{2}$ and $\lambda$ as follows:

\[
R^2_{\text{efwa},t-1} = \sum_{s=0}^{t-1} \frac{e_s + d_s}{\sum_{r=0}^{t-1} e_r + d_r} \cdot R^2_s
\]

(12)

\[
\frac{1}{\lambda_{\text{efwa},t-1}} = \sum_{s=0}^{t-1} \frac{e_s + d_s}{\sum_{r=0}^{t-1} e_r + d_r} \cdot \frac{1}{\lambda_{s}}
\]

(13)

These variables take high values for firms that raised external finance when information asymmetry was low and vice versa. $e$ and $d$ are, respectively, the net equity and debt issues, as defined earlier.

The first test consists of dividing the sample, based on the value of $R^2_{\text{efwa},t-1}$ and $\frac{1}{\lambda_{\text{efwa},t-1}}$ and retesting the equity market timing. To create the sub-samples, I rank companies
by quartiles from high to low $R^2_{\text{efwa},t-1}$ or $\frac{1}{\lambda_{\text{efwa},t-1}}$. This ranking procedure makes it possible to control for adverse selection market timing.

Companies in the upper and lower quartiles, respectively, issue securities in times of low adverse selection and do not issue in times of high adverse selection. In the median quartiles, companies’ decisions to issue securities do not seem to be related to adverse selection.

A dummy variable is added to equation (4) as follows:

$$
\left( \frac{D}{A} \right)_t = \alpha + \beta_1 \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_{\text{efwa},t-1} + \beta_2 \left( \frac{M}{B} \right)_{\text{efwa},t-1} + \beta_3 \text{Dum}_i \left( \frac{M}{B} \right)_{\text{efwa},t-1} + \\
+ \beta_4 \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_t + \beta_5 \left( \frac{M}{B} \right)_{t-1} + \beta_6 \left( \frac{\text{PPE}}{A} \right)_{t-1} + \beta_7 \left( \frac{\text{EBITDA}}{A} \right)_{t-1} + \\
+ \beta_8 \text{Ln}(S)_{t-1} + \epsilon_t
$$

(14)

Where

$$D_{\text{umu}} = \begin{cases} 1 & \text{for companies in the upper quartile,} \\ 0 & \text{otherwise.} \end{cases}$$

A negative sign for $\beta_3$ would give support to the dynamic adverse selection version of the equity market timing theory.

Close-to-Offer returns

For the following test, I rank firms by quartiles based on the return from the closing price on the day prior to the offer, to the offer price. Firms in the upper quartile are firms that have the lowest price discount compared to the earlier day closing price. I then use the following regression:

$$
\left( \frac{D}{A} \right)_t = \alpha + \beta_1 \left( \frac{M}{B} \right)_{\text{efwa},t-1} + \text{Dum}_i \beta_2 \left( \frac{M}{B} \right)_{\text{efwa},t-1} + \beta_3 \left( \frac{M}{B} \right)_{t-1} + \beta_4 \left( \frac{\text{PPE}}{A} \right)_{t-1} + \\
+ \beta_5 \left( \frac{\text{EBITDA}}{A} \right)_{t-1} + \beta_6 \text{Ln}(S)_{t-1} + \epsilon_t
$$

(15)
Where

\[ D_{\text{um},i} \] = dummy variable equal to one for companies in the upper quartile, zero otherwise.

The dummy variable equals one for companies that issue equity in times of low information asymmetry (lowest price discount). A negative sign for \( \beta_2 \) would give support to the dynamic adverse selection version of the equity market timing theory.

As a robustness check, I conduct a second test following the same methodology as for net insider selling. Equation (9) and (10) test the short-term relation between the change in leverage and adverse selection. The expected signs of the coefficient \( \beta_1 \), as explained earlier, would show that as adverse selection increases, equity issues decrease, and leverage increases.

The long-term relationship between the debt ratio and the dynamic adverse selection based market timing can be tested using the following set of regressions:

\[
\left( \frac{D}{A} \right)_{t} = \alpha + \beta_1 (R^2)_{efwa,t-1} + \beta_2 \left( \frac{M}{B} \right)_{efwa,t-1} + \beta_3 (R^2)_{t-1} + \beta_4 \left( \frac{M}{B} \right)_{t-1} \\
+ \beta_5 \left( \frac{PPE}{A} \right)_{l-1} + \beta_6 \left( \frac{EBITDA}{A} \right)_{l-1} + \beta_7 \ln(S)_{l-1} + \epsilon_t
\]

(16)

\[
\left( \frac{D}{A} \right)_{t} = \alpha + \beta_1 \left( \frac{1}{\lambda} \right)_{efwa,t-1} + \beta_2 \left( \frac{M}{B} \right)_{efwa,t-1} + \beta_3 \left( \frac{1}{\lambda} \right)_{t-1} + \beta_4 \left( \frac{M}{B} \right)_{t-1} \\
+ \beta_5 \left( \frac{PPE}{A} \right)_{l-1} + \beta_6 \left( \frac{EBITDA}{A} \right)_{l-1} + \beta_7 \ln(S)_{l-1} + \epsilon_t
\]

(17)

The lagged values of the two measures of adverse selection are included to control for their contemporaneous correlations with the debt ratio. A negative sign on the coefficient \( \beta_1 \) would support the dynamic adverse selection version of the equity market timing theory, as defined by BW.

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Testing Hypothesis 11

Hypothesis 11: Any positive relationship between the debt ratio and historical levels adverse information is more significant for small companies.

To test for the size effect, I rank companies by quartiles based on market capitalization, and add a dummy variable to the previous regressions (equations 16 and 17). The dummy variable equals one for companies in the lower quartile (small companies), zero otherwise, and is multiplied by the two measures of adverse selection’s weighted averages. A negative sign is expected on the coefficient of the dummy variable.

All my hypotheses and the methodology used to test them are summarized in Table 2.
<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Methodology</th>
<th>Literature used</th>
</tr>
</thead>
</table>
| 8. There is a positive relationship between the change in leverage and existing level of adverse selection. | Regression Analysis: Change in leverage on Control variables plus adverse selection measures. | Lucas and MacDonald (1990)  
Korajczyk, Lucas, and MacDonald (1992)  
Choe, Masulis, and Nanda (1993) |
|---|---|---|
| 9. Any positive relationship between the change in leverage and measures of adverse selection is driven by equity issues. | Regression Analysis: Components of the Change in leverage on Control variables plus adverse selection measures. | Venkatesh and Chiang (1986)  
Chiang and Venkatesh (1988)  
Lin, Sanger and Booth (1995)  
Rajan and Zingales (1995)  
Baker and Wurgler (2002) |
| 10. There is a positive relationship between the debt ratio and historical levels of adverse selection. | Regression Analysis: Leverage on Control variables plus equity finance weighted average: market-to-book and net insider selling, and dummy variables for adverse selection.  
And Regression Analysis: Leverage on Control variables plus equity finance weighted average measures of adverse selection. | Smith (1977)  
Rajan and Zingales (1995)  
Bayless and Chaplinsky (1996)  
Baker and Wurgler (2002)  
Corwin (2003) |
| 11. Any positive relationship between the debt ratio and historical levels adverse information is more significant for small companies. | Regression Analysis: Leverage on Control variables plus equity finance weighted average measures of adverse selection and a dummy variable for size. | Kester (1986)  
Chari, Jagannathan, and Ofer (1988)  
Lin and Howe (1990) |
Chapter 5

RESULTS

Hypothesis 1

There is a negative relationship between the change in leverage and net insider selling.

The objective of the first part of this dissertation is to retest the equity market timing theory of capital structure as presented by Baker and Wurgler (2002) (BW). As opposed to BW’s use of market-to-book, I use, in this first part of the study, the net insider selling (insider selling minus purchases, over trading volume) as a measure of equity market timing. The change in leverage is regressed on the value in year $t$ of the level of net insider selling, and in year $t-1$ of the control variables for the determinants of capital structure from Rajan and Zingales (1995).

We can see in Table 5 that a negative relationship exists between net insider selling and annual change in leverage. The control variables have similar economical and statistical significance to those documented in previous studies. Moreover, market-to-book is still statistically significant, in the book-value leverage regression, even with the introduction of the net insider selling variable.

Hypothesis 2

There is a positive correlation between market-to-book and net insider selling.

Table 6 shows a highly significant 10 percent positive correlation between market-to-book and net insider selling. This gives further support to the use of net insider selling as an alternative to market-to-book ratio in our following tests. This result is consistent with Piotroski

Hypothesis 3

*There is a negative relationship between the debt ratio and historical levels of net insider selling.*

I start by performing two similar long-term relationship tests, between market-to-book and leverage, as in BW. The first test uses the weighted average market-to-book, by firm, from the first appearance on Compustat to year \( t - 1 \). The second uses the weighted average market-to-book, by firm, from 1987 to year \( t - 1 \). The results in the appendix show no major difference between the coefficients on the weighted average market-to-book for the two time periods. Therefore, the following tables will use information starting from 1987, which allows me to merge the data from different data sources.

We can see from Table 7 that the weighted-average net insider selling is negatively related to the debt ratio. The inclusion of the current year’s net insider selling, and the weighted average market-to-book does not affect this result. The *R*-square is higher than in BW in both the book leverage regression: 0.25 vs. 0.20 and the market leverage regression: 0.44 vs. 0.35. This result supports BW’s equity market timing theory of capital structure.

Hypothesis 4

*The adverse selection motive of the equity market timing predicts a positive correlation between the change in leverage and subsequent performance, for companies that issue equity and are net insider sellers.*

Under the adverse selection hypothesis, managers do have inside information and act based on it. When managers are net sellers in equity issuing companies, we expect a valid forecast of
negative subsequent returns. I use both ROS data and book values to determine companies that issue equity. Using book values, a firm is defined as equity issuer if its change in book equity, minus the change in retained earnings, divided by assets (equity issues), is positive, and the residual change in assets divided by assets (debt issues) is less than, or equal to, zero.

Table 8 shows a positive but small correlation between the change in leverage and subsequent performance, for companies that issue equity and are net insider sellers\(^1\). The correlation is statistically significant in both book leverage and market leverage only when the book value data are used. This difference between the results may be due to the difference in size between the two samples. The low correlation indicates that the change in leverage for equity issuing insider selling firms does not always forecast subsequent returns.

Hypothesis 5

*Any negative relationship between the debt ratio and the historical levels of net insider selling is driven by adverse selection market timing.*

Because of the low correlation result of hypothesis 4, I construct a dummy variable related to companies whose subsequent returns were significantly low. In table 9, the dummy variable takes the value of one for equity issuing, insider selling companies that consistently under performed the Fama-French 10*10 control portfolios in the subsequent returns, and zero otherwise. We can see that the dummy variable is negatively related to the debt ratio. In table 10, the dummy variable takes the value of one for equity issuing, insider selling companies that rank

---

\(^1\) Correlations between excess return and subsequent performance were also tested but did not yield any significant results. The methodology for testing the excess returns is similar to Jenter (2003), which is based on Fama and French (1993) control portfolios. Excess return is the difference between the returns of the sample firm and the control portfolio’s, which is the 10*10 Fama-French size and book-to-market control portfolios. Each firm is matched to its control portfolio using the ratio of book-to-market equity in December of year \(t\), and the market capitalization, which measures size, as of June of year \(t+1\). Returns are measured over twelve months starting in July of year \(t+1\) for both the sample firm and the control portfolio. The insignificant results may be due to the fact that the information that affects a firm negatively may also affect the control portfolio.
in the lowest two deciles in performance, in the subsequent period, and zero otherwise. The
dummy variable is again negatively related to the debt ratio. The coefficient on the dummy is
more significant in book leverage regressions than in market leverage. These negative
relationships indicate that managers do time the equity issues as well as their own portfolios
trading based on inside information.

In table 11, we can see that the coefficients on the two dummy variables are negative and
highly significant. The first dummy variable takes the value of one for companies whose insiders
are net sellers, and zero otherwise. The second dummy variable takes the value of one for equity
issuing, insider selling companies that consistently under performed the control portfolios in the
subsequent period, and zero otherwise. In table 9, the latter dummy variable was applied to the
net insider selling variable instead of market-to-book. Even with the inclusion of the first dummy
variable that can proxy for both versions of the timing theory, the sign on the second dummy
supports exclusively an information based market timing.

Hypothesis 6

There is a negative correlation between $\lambda$ and R-square.

As no one measure is a “good” measure of information asymmetry, I use two proxies in
my tests. Before using these proxies in the following tests, Hypothesis 6 measures the degree of
correlation between them. Table 12 shows as expected a negative but low correlation between
the two measures of the adverse selection component of the bid-ask spread.

Hypothesis 7

There is a positive correlation between market-to-book and R-square, and a negative
correlation between market-to-book and $\lambda$. 
As opposed to BW’s argument of inverse relation between the extent of adverse selection and the market-to-book ratio, table 13 shows that market-to-book is positively related to measures of information asymmetry. Market-to-book is positively correlated with $\lambda$ and negatively correlated with $R$-square. However, the correlations are low, especially in the case of the second measure of adverse selection—$R$-square.

Hypothesis 8

*There is a positive relationship between the change in leverage and existing level of adverse selection.*

Tables 14 and 15 show the short-term relations between the change in leverage and existing adverse selection as measured by the two measures of the adverse selection component of the bid-ask spread. The change in leverage is negatively related to $\lambda$ and positively related to $R$-square. Thus, as opposed to what was expected, there exist a negative relationship between the change in leverage and existing adverse selection.

Hypothesis 9

*Any positive relationship between the change in leverage and measures of adverse selection is driven by equity issues.*

As expected, the relationship between the change in leverage and adverse selection comes mainly from equity issues. We can see from tables 16 and 17 that when regressed on the components of the change in leverage, adverse selection measures are only related to net equity issues. As in BW, theses results indicate that, like market-to-book, the effect of adverse selection on changes in leverage comes through net equity issues. However, like in hypothesis 8, the signs are the opposite of those expected.
Hypothesis 10

There is a positive relationship between the debt ratio and historical levels of adverse selection.

To test hypothesis 10, I present three series of results concerning the adverse selection version of the equity market timing.

In the first set of tests, a dummy variable is added to equation 4 to test the adverse selection hypothesis. First I construct the external finance weighted average of $1$ over the first measure of adverse selection ($1/\lambda$) and the second measure of adverse selection ($R$-square). The sample is then divided based on the value of each one of these two weighted averages, and companies ranked by quartiles. The dummy variable takes the value of one for companies in the upper quartile, zero otherwise, and is multiplied by the weighted average market-to-book. Companies in the upper quartile issue securities in times of low adverse selection. This procedure can show whether BW results on the weighted average market-to-book were mainly due to the dynamic adverse selection model. It can be seen from Tables 18 and 19 that the coefficient on the dummy variable is not statistically significant.

For the next test, firms are ranked by quartiles based on the close-to-offer returns. I add to BW regression a dummy variable that takes the value of one for companies in the upper quartile, zero otherwise, that is multiplied by the weighted average market-to-book. The results in table 20 indicate that the coefficient on the dummy variable is again not statistically significant.

Next, the two measures of adverse selection’s weighted averages are used in separate regressions with leverage as dependent variable. I substitute the weighted average adverse selection for the weighted average market-to-book in BW. In table 21 we can see no statistically significant relationship between the debt ratio and the weighted average of $1/\lambda$. In the case of
Rsquare, table 22, only in the market leverage regression is the weighted average related to the
debt ratio. However, even in the latter case and as opposed to what was expected the relationship
between the weighted average Rsquare and the debt ratio is positive.

Hypothesis 11

*Any positive relationship between the debt ratio and historical levels adverse
information is more significant for small companies.*

Hypothesis 11 tests whether small companies, known to have higher degrees of
information asymmetry, may be driving the effect of adverse selection on market timing. I rank
companies by quartiles based on market capitalization and add a dummy variable to the latter
regressions. The dummy variable equals one for companies in the lower quartile, zero otherwise,
and is multiplied by the two measures of adverse selection’s weighted averages. The coefficient
on the dummy variable in tables 23 and 24 is positive and highly significant. However, the sign
on the dummy variable is the reverse of what was expected.
Chapter 6

DISCUSSION

Market-To-Book and Information Asymmetry

Market-to-book ratio is typically used as a measure of growth opportunities. It has also been used in finance literature as a measure of information asymmetry. Smith and Watts (1992) show that managers of high growth firms tend to have better information about their firm’s investment opportunities and expected cash flows than do outside investors. This may explain the positive relationship found between market-to-book and the adverse selection component of the bid-ask spread.

Leverage and Information Asymmetry

Myers (1984) argues that firms with significant intangible assets (high market-to-book) will highly value financial flexibility and low debt level. Also, Sunder (2002) provides evidence that the borrowing costs of firms decrease as information production increases in stock markets. Sunder shows that when firms issue equity, they benefit from the information spillover through, among other things, a reduction in adverse selection costs of future financing. Following this argument, firms would tend to issue equity in times of high, not low, information asymmetry. This may explain why the change in leverage is found to be negatively correlated with the adverse selection component of the spread.

To test this argument, I run new regressions using weighting schemes based on the idea that firms issue equity in times of high information asymmetry. Since our second measure of the
adverse selection component of the bid-ask spread, *R-square*, measures levels of information
symmetry, I now use 1- *R-square*, which like $\lambda$, is a straight measure of information asymmetry.

The weighted-average adverse selection measures used in equations 12 and 13 are modified as
follows:

$$ (1 - R^2)_{fw, t-1} = \sum_{s=0}^{t-1} \sum_{r=0}^{t-1} e_s + d_s \cdot (1 - R^2)_s $$

$$ \lambda_{fw, t-1} = \sum_{s=0}^{t-1} \sum_{r=0}^{t-1} e_s + d_s \cdot \lambda_s $$

The sample is again divided based on the value of each one of the two weighted-averages
and companies ranked by quartiles. The dummy variable takes the value of one for companies in
the upper quartile, zero otherwise, and is multiplied by the weighted average market-to-book.

Companies in the upper quartile are more likely to be those that issue securities in times of high
adverse selection.

It can be seen from Tables 25 that the coefficient on the dummy is negative and
significant. However, in table 26, when I use 1-*Rsquare* for ranking, the dummy variable is not
significant.

Next, I use the two measures of adverse selection’s weighted-averages in separate
regressions with leverage as dependent variable. I substitute the weighted-average adverse
selection for the weighted-average market-to-book in BW’s study. In table 27 we can see that the
weighted average $\lambda$ is not significant, while in table 28 the weighted average 1-*Rsquare* is
statistically significant only in the market leverage regression.
These mixed results are not consistent with the dynamic adverse selection version of the equity market timing theory. One reason for that may be the variables used are invalid proxies for adverse selection.

Size Effect

We can see in tables 29 and 30 that using the new adverse selection measures weighting scheme to test hypothesis 11 does not change the results found earlier. It is difficult to interpret these results with respect to the size effect. This will be left to future research.

Information Based Market Timing

In the pecking order theory, proposed by Myers (1984), companies, in order to reduce information asymmetry costs, prefer to use retained earnings to finance growth opportunities. If further financing is required, preference will be given to secured debt first, convertible debt, and equity, in that order. However, Helwege and Liang (1996) find no relationship between the probability of raising external financing and the need for funds. Moreover, they show that firms that could have obtained bank loans chose to issue equity instead. Hence, a company can issue equity or debt even in the absence of any investment opportunities. Also, in contrast with the pecking order theory, this finding shows that retained earnings and debt are not always preferred to equity issues.

One reason why a company may choose to issue equity may be to build slack, especially when managers feel the company is overvalued, especially when bad prospects are anticipated in the near future. In preparation for possible future investment opportunities, managers may issue equity when they have inside information even if it results in price discount. This will happen when benefit from issuing overvalued equity is high enough to offset the price discount.
This story differs from the pecking order theory in that equity issue is not always the last resort funding option. In case of bad inside information, companies may deliberately choose to raise external equity instead of raising debt or using internal financing. High market-to-book associated with inside information about low subsequent performance may lead to equity financing. The money raised would help build enough slack to avoid any external financing when the company needs to finance positive NPV projects in the future.

The results of the present study support an information based market timing theory that is different from the dynamic version of Myers and Majluf (1984). In this naïve adverse selection model, managers are only acting based on the information they have and independently of investors’ perceptions of adverse selection levels. Managers are not timing the levels of information asymmetry; they only issue equity when the benefit from the inside information based overvaluation is expected to be higher than the expected price discount following the issue.

With no optimal capital structure, managers do not need to rebalance to optimal levels of debt after timing the market. This leads the equity issues decisions to have a permanent effect on the leverage ratio.
Chapter 7

CONCLUSION

A theory developed by previous research states that capital structure evolves as the cumulative outcome of past attempts to time the equity market. However, there are two versions of equity market timing: perceived mispricing and adverse selection. The objective of this study is to discriminate between these two possible motives underlying the relationship between equity market timing and capital structure.

The methodology used in this dissertation is based on the theory of capital structure determinants described above, as well as on the methodology followed by the authors of the equity market timing theory (Baker and Wurgler, 2002). I also introduce a new test of the relationship between market timing and capital structure. Specifically, I use net insider selling as an alternative to market-to-book ratio used in BW’s test. I test net insider selling’s short-term relationship with the change in leverage, and its long-term relationship with the debt ratio using BW’s weighted-average scheme. Then I formally test the two versions of the equity market timing: first by using post-issuance performance, and then by using three measures of adverse selection. The first two measures use estimates of adverse information costs based on the bid and ask prices, and the third measure is the close-to-offer returns. The final test in this research is a size effect test.

The first set of results pertaining to the retest of the equity market timing theory provides evidence in support of the theory. Net insider selling is negatively related to the change in
leverage and positively related to market-to-book. The weighted-average net insider selling negatively impacts the debt ratio. I find a small but positive correlation between the change in leverage and subsequent performance for companies that issue equity and are net insider sellers. I also find that if these companies perform poorly in periods subsequent to equity issues, their debt ratio is declining significantly. This finding provides support for an information based market timing theory.

The goal of the second set of tests is to empirically examine the dynamic adverse selection version of the market timing theory. This version suggests that managers issue equity when adverse information costs are low. I show that market-to-book is relatively positively correlated with adverse selection. I also find that the change in leverage is negatively related to adverse selection, due mainly to the net equity issues component of the change in leverage. The results are inconclusive when I use multiple regressions with different proxies for adverse selection. The mixed results can not support the dynamic adverse selection hypothesis. These results do not change even when, based on the information spillover theory, I allow for equity issues to vary positively with information asymmetry.
Table 3

Summary Statistics of Capital Structure and Financing Decisions-All firms

Means and Standard deviations of leverage and security issues. Book value leverage is book debt to assets. Market value leverage is book debt divided by the result of total assets, minus book equity, plus market equity. Equity issues are defined as the change in book equity, minus the change in retained earnings, divided by assets. Newly retained earnings are defined as the change in retained earnings divided by assets. Debt issues are defined as the residual change in assets divided by assets. The sample comes from Compustat, and it excludes financial firms, firms with low values of assets, and firm-year outliers.

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>Book Leverage%</th>
<th>S.D.</th>
<th>Market Leverage%</th>
<th>S.D.</th>
<th>Equity Issues %</th>
<th>S.D.</th>
<th>Debt Issues %</th>
<th>S.D.</th>
<th>Newly R.E. %</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970-1974</td>
<td>9,768</td>
<td>49.46</td>
<td>(15.67)</td>
<td>51.57</td>
<td>(22.90)</td>
<td>1.44</td>
<td>(5.99)</td>
<td>4.67</td>
<td>(15.09)</td>
<td>2.47</td>
<td>(6.85)</td>
</tr>
<tr>
<td>1975-1979</td>
<td>12,785</td>
<td>49.76</td>
<td>(15.41)</td>
<td>53.85</td>
<td>(20.77)</td>
<td>1.30</td>
<td>(4.88)</td>
<td>4.42</td>
<td>(12.50)</td>
<td>3.46</td>
<td>(6.38)</td>
</tr>
<tr>
<td>1980-1984</td>
<td>12,498</td>
<td>48.95</td>
<td>(16.35)</td>
<td>47.90</td>
<td>(22.05)</td>
<td>2.49</td>
<td>(8.22)</td>
<td>3.02</td>
<td>(14.29)</td>
<td>2.14</td>
<td>(7.81)</td>
</tr>
<tr>
<td>1985-1989</td>
<td>11,951</td>
<td>49.56</td>
<td>(18.21)</td>
<td>43.52</td>
<td>(21.22)</td>
<td>2.40</td>
<td>(10.20)</td>
<td>4.57</td>
<td>(17.67)</td>
<td>0.90</td>
<td>(10.62)</td>
</tr>
<tr>
<td>1990-1994</td>
<td>12,752</td>
<td>49.56</td>
<td>(18.91)</td>
<td>41.76</td>
<td>(22.08)</td>
<td>2.85</td>
<td>(11.61)</td>
<td>2.47</td>
<td>(17.03)</td>
<td>0.25</td>
<td>(11.35)</td>
</tr>
<tr>
<td>1995-1999</td>
<td>15,750</td>
<td>50.42</td>
<td>(19.48)</td>
<td>39.34</td>
<td>(22.24)</td>
<td>2.90</td>
<td>(13.06)</td>
<td>4.36</td>
<td>(19.12)</td>
<td>0.77</td>
<td>(11.78)</td>
</tr>
</tbody>
</table>
Table 4
Frequency Distribution of Equity Issues

The sample consists of 779 seasoned new equity issues during 1983-1988. Data are obtained from the ROS tapes. The final sample satisfies the following criteria: (a) The security issue is not a combination of different classes of securities. (b) The issue is not a shelf registration or rights offering. (c) Security returns must be available from CRSP. (d) Data on insider trading are available from ORS. Financial firms are excluded.

<table>
<thead>
<tr>
<th>Year</th>
<th>Equity Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983</td>
<td>220</td>
</tr>
<tr>
<td>1984</td>
<td>100</td>
</tr>
<tr>
<td>1985</td>
<td>104</td>
</tr>
<tr>
<td>1986</td>
<td>133</td>
</tr>
<tr>
<td>1987</td>
<td>121</td>
</tr>
<tr>
<td>1988</td>
<td>101</td>
</tr>
<tr>
<td>1983-1988</td>
<td>779</td>
</tr>
</tbody>
</table>
Table 5
Determinants of Annual Change in Leverage and Insider Trading

OLS regressions of change in book and market leverage on the ratio of net insider selling over trading volume, market-to-book ratio, fixed assets, profitability, firm size, and lagged leverage.

\[
\left( \frac{D}{A} \right)_{t} - \left( \frac{D}{A} \right)_{t-1} = \alpha + \beta_1 \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_t + \beta_2 \left( \frac{M}{B} \right)_{t-1} + \beta_3 \left( \frac{\text{PPE}}{A} \right)_{t-1} + \beta_4 \left( \frac{\text{EBITDA}}{A} \right)_{t-1} + \beta_5 \ln(S)_{t-1} + \beta_6 \left( \frac{D}{A} \right)_{t-1} + \epsilon_t
\]

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity and is expressed in percentage terms. Net insider selling over trading volume is total insider selling minus purchasing all divided by trading volume and is measured at time \(t\). We examine trades by company executives, officers, directors, and controlling persons. We exclude firm year observations where the absolute value of net insider selling over trading volume is above 0.5. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10. Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. We do not report \(\alpha\) and \(\beta_6\). The book change in leverage is in Panel A. The market change in leverage is in Panel B. \(t\)-statistics are in parentheses.

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>Net In. Sell/Trad.Vol.</th>
<th>M/B (_{t-1})</th>
<th>PPE/A (_{t-1}) %</th>
<th>EBITDA/A (_{t-1}) %</th>
<th>Log(S) (_{t-1})</th>
<th>(R^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987-2000</td>
<td>10,714</td>
<td>-6.72 (-8.32)</td>
<td>-0.34 (-2.78)</td>
<td>0.01 (2.63)</td>
<td>-0.12 (-7.75)</td>
<td>0.72 (11.58)</td>
<td>0.11</td>
</tr>
</tbody>
</table>

Panel A: Change in Book Leverage %

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>Change in Market Leverage %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987-2000</td>
<td>10,714</td>
<td>-14.46 (-14.63)</td>
</tr>
</tbody>
</table>
Table 6
Correlation between Market-to-Book and Insider Trading

Pearson’s correlation coefficient between market-to-book and net insider selling in years 1987 to 2000. Net insider selling over trading volume is total insider selling minus purchasing all divided by trading volume. We examine trades by company executives, officers, directors, and controlling persons. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10 or the absolute value of net insider selling over trading volume is above 0.5.

<table>
<thead>
<tr>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Correlation Coefficient with Market-to-Book</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Sell/Trading Vol.</td>
<td>10,064</td>
<td>0.02</td>
<td>0.10***</td>
</tr>
</tbody>
</table>

*** Statistically significant at the 1% level.
Table 7
Determinants of Leverage and Insider Trading

OLS regressions of book and market leverage on the ratio of net insider selling over trading volume, market-to-book ratio, fixed assets, profitability, and firm size.

\[
\left( \frac{D}{A} \right)_t = \alpha + \beta_1 \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_{\text{efwa},t} + \beta_2 \left( \frac{M}{B} \right)_{\text{efwa},t-1} + \beta_3 \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_t + \beta_4 \left( \frac{M}{B} \right)_{t-1} \\
+ \beta_5 \left( \frac{\text{PPE}}{A} \right)_{t-1} + \beta_6 \left( \frac{\text{EBITDA}}{A} \right)_t + \beta_7 \ln(S)_{t-1} + \varepsilon_t
\]

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity and is expressed in percentage terms. Net insider selling over trading volume is total insider selling minus purchasing all divided by trading volume. We examine trades by company executives, officers, directors, and controlling persons. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10 or the absolute value of net insider selling over trading volume is above 0.5. Net insider trading over trading volume and market-to-book are defined in two ways. The first is a weighted average net insider selling over trading volume, and market-to-book, from year 1987 to year \( t \) for net insider selling and to \( t-1 \) for market-to-book. The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. The second is the net insider selling over trading volume and market-to-book ratio, respectively, in year \( t \) and year \( t-1 \). Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. \( t \)-statistics are in parentheses.

<table>
<thead>
<tr>
<th></th>
<th>Book Leverage</th>
<th>Market Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N</strong></td>
<td>5,154</td>
<td>5,154</td>
</tr>
<tr>
<td><strong>Ins.Sell/Trad.Vol.</strong></td>
<td>-6.42</td>
<td>-7.53</td>
</tr>
<tr>
<td></td>
<td>(-2.91)</td>
<td>(-3.36)</td>
</tr>
<tr>
<td><strong>M/B_{\text{efwa},t-1}</strong></td>
<td>-6.45</td>
<td>-8.34</td>
</tr>
<tr>
<td></td>
<td>(-13.88)</td>
<td>(-17.62)</td>
</tr>
<tr>
<td><strong>Ins.Sell/Trad.Vol.</strong></td>
<td>-8.39</td>
<td>-19.95</td>
</tr>
<tr>
<td></td>
<td>(-4.55)</td>
<td>(-10.64)</td>
</tr>
<tr>
<td><strong>M/B_{t-1}</strong></td>
<td>1.82</td>
<td>-3.13</td>
</tr>
<tr>
<td></td>
<td>(4.05)</td>
<td>(-6.84)</td>
</tr>
<tr>
<td><strong>PPE/A_{t-1} %</strong></td>
<td>0.03</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>(2.76)</td>
<td>(5.91)</td>
</tr>
<tr>
<td><strong>EBITDA/A_{t-1} %</strong></td>
<td>-0.54</td>
<td>-0.71</td>
</tr>
<tr>
<td></td>
<td>(-14.10)</td>
<td>(-18.21)</td>
</tr>
<tr>
<td><strong>Log(S)_{t-1}</strong></td>
<td>3.42</td>
<td>1.66</td>
</tr>
<tr>
<td></td>
<td>(26.51)</td>
<td>(12.63)</td>
</tr>
<tr>
<td><strong>R^2</strong></td>
<td>0.25</td>
<td>0.44</td>
</tr>
</tbody>
</table>
Table 8
Correlation between Annual Change in leverage and Subsequent Performance

Pearson’s correlation coefficient between annual change in leverage and subsequent performance, in years 1987 to 2000, for companies that issue equity and are net insider sellers. A firm is defined as net seller, in a given year, if the yearly difference between insider selling and purchasing is positive. We examine trades by company executives, officers, directors, and controlling persons. Subsequent returns are measured over twelve months starting in July of year $t+1$. We use both Registered Offering Statistics (ROS) data, and book values to define equity issuers. Using book values, a firm is defined as equity issuer if its change in book equity, minus the change in retained earnings, divided by assets (equity issues) is positive, and the residual change in assets divided by assets (debt issues) is less than, or equal to, zero. Newly retained earnings are defined as the change in retained earnings divided by assets.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Annual Change in Book Leverage %</th>
<th>Annual Change in Market Leverage %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute Returns</td>
<td>1,326</td>
<td>0.06**</td>
<td>0.06**</td>
</tr>
<tr>
<td>(Book Values)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absolute Returns</td>
<td>425</td>
<td>0.10**</td>
<td>-0.03</td>
</tr>
<tr>
<td>(ROS)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** Statistically significant at the 5% level.
Table 9
Leverage and Adverse Selection Market Timing
OLS regressions of book and market leverage on the ratio of net insider selling over trading volume, market-to-book ratio, fixed assets, profitability, and firm size.

\[
\left( \frac{D}{A} \right)_t = \alpha + \beta_1 \left( \frac{Net. Ins. Sell}{Trad. Vol.} \right)_{fwa,t} + \beta_2 \text{Dum}_t \left( \frac{Net. Ins. Sell}{Trad. Vol.} \right)_{fwa,t} + \beta_3 \left( \frac{M}{B} \right)_{fwa,t-1} \\
+ \beta_4 \left( \frac{Net. Ins. Sell}{Trad. Vol.} \right)_t + \beta_5 \left( \frac{M}{B} \right)_{t-1} + \beta_6 \left( \frac{PPE}{A} \right)_{t-1} + \beta_7 \left( \frac{EBITDA}{A} \right)_{t-1} \\
+ \beta_8 \ln(S)_{t-1} + \epsilon_t
\]

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity and is expressed in percentage terms. Net insider selling over trading volume is total insider selling minus purchasing all divided by trading volume. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10 or the absolute value of net insider selling over trading volume over trading volume is over 0.5. Net insider trading over trading volume and market-to-book are defined in two ways. The first is a weighted average net insider selling over trading volume, and market-to-book, from year 1987 to year t for net insider selling and to t-1 for market-to-book. The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. The second is the net insider selling over trading volume and market-to-book ratio, respectively, in year t and year t-1. Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. Dummy variable equals one for equity issuing, insider selling companies that consistently under performed the control portfolios in the subsequent period, zero otherwise. t-statistics are in parentheses.

<table>
<thead>
<tr>
<th>Book Leverage</th>
<th>Market Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>5,163</td>
</tr>
<tr>
<td>Ins.Sell/Trad.Vol.</td>
<td>-5.10</td>
</tr>
<tr>
<td></td>
<td>(-2.25)</td>
</tr>
<tr>
<td>Dum_t (Ins.Sell/Trad.Vol)</td>
<td>-21.49</td>
</tr>
<tr>
<td></td>
<td>(-2.46)</td>
</tr>
<tr>
<td>M/B_{fwa,t-1}</td>
<td>-6.45</td>
</tr>
<tr>
<td></td>
<td>(-13.89)</td>
</tr>
<tr>
<td></td>
<td>(-4.55)</td>
</tr>
<tr>
<td>M/B_{t-1}</td>
<td>1.81</td>
</tr>
<tr>
<td></td>
<td>(4.02)</td>
</tr>
<tr>
<td>PPE/A_{t-1} %</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>(2.78)</td>
</tr>
<tr>
<td>EBITDA/A_{t-1} %</td>
<td>-0.54</td>
</tr>
<tr>
<td></td>
<td>(-14.17)</td>
</tr>
<tr>
<td>Log(S)_{t-1}</td>
<td>3.42</td>
</tr>
<tr>
<td></td>
<td>(26.57)</td>
</tr>
</tbody>
</table>

\[ R^2 \] 0.25 0.44
Table 10  
Leverage, Performance, and Adverse Selection Market Timing

OLS regressions of book and market leverage on the ratio of net insider selling over trading volume, market-to-book ratio, fixed assets, profitability, and firm size.

\[
\left( \frac{D}{A} \right)_{t} = \alpha + \beta_{1} \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_{\text{efwa}, t} + \beta_{2} \text{Dum}_{t} \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_{\text{efwa}, t} + \beta_{3} \left( \frac{M}{B} \right)_{\text{efwa}, t-1} + \beta_{4} \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_{t} + \beta_{5} \left( \frac{M}{B} \right)_{t-1} + \beta_{6} \left( \frac{\text{PPE}}{A} \right)_{t-1} + \beta_{7} \left( \frac{\text{EBITDA}}{A} \right)_{t-1} + \beta_{8} \ln(S)_{t-1} + \varepsilon_{t}
\]

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity and is expressed in percentage terms. Net insider selling over trading volume is total insider selling minus purchasing all divided by trading volume. We examine trades by company executives, officers, directors, and controlling persons. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10 or the absolute value of net insider selling over trading volume is over 0.5. Net insider trading over trading volume and market-to-book are defined in two ways. The first is a weighted average net insider selling over trading volume, and market-to-book, from year 1987 to year \( t \) for net insider selling and to \( t-1 \) for market-to-book. The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. The second is the net insider selling over trading volume and market-to-book ratio, respectively, in year \( t \) and year \( t-1 \). Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. Dummy variable equals one for equity issuing, insider selling companies that rank in the lowest two deciles in performance, in the subsequent period, zero otherwise. \( t \)-statistics are in parentheses.

<table>
<thead>
<tr>
<th></th>
<th>Book Leverage</th>
<th>Market Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>5,154</td>
<td>5,154</td>
</tr>
<tr>
<td>( \text{Ins.Sell/Trad.Vol.}_{\text{efwa}, t} )</td>
<td>-5.70 (-2.56)</td>
<td>-7.16 (-3.16)</td>
</tr>
<tr>
<td>( \text{Dum}<em>{t} \left( \text{Ins.Sell/Trad.Vol.}</em>{\text{efwa}, t} \right) )</td>
<td>-37.62 (-2.45)</td>
<td>-19.29 (-1.23)</td>
</tr>
<tr>
<td>( \frac{M}{B}_{t-1} )</td>
<td>-6.45 (-13.89)</td>
<td>-8.34 (-17.62)</td>
</tr>
<tr>
<td>( \frac{PPE}{A}_{t-1} % )</td>
<td>-0.54 (-14.12)</td>
<td>-0.71 (-18.21)</td>
</tr>
<tr>
<td>( \frac{\text{EBITDA}}{A}_{t-1} % )</td>
<td>0.03 (2.78)</td>
<td>0.06 (5.92)</td>
</tr>
<tr>
<td>Log(S) ( t-1 )</td>
<td>3.41 (26.41)</td>
<td>1.65 (12.57)</td>
</tr>
<tr>
<td>( R^{2} )</td>
<td>0.25</td>
<td>0.44</td>
</tr>
</tbody>
</table>
Leverage and Mispricing Based Market Timing

OLS regressions of book and market leverage on the ratio of net insider selling over trading volume, market-to-book ratio, fixed assets, profitability, and firm size.

\[
\left( \frac{D}{A} \right)_{t} = \alpha + \beta_1 \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_{\text{efwa},t} + \beta_2 \left( \frac{M}{B} \right)_{\text{efwa},t-1} + \beta_3 \text{Dum}_{1,i,t} \left( \frac{M}{B} \right)_{\text{efwa},t-1} + \beta_4 \text{Dum}_{2,j,t} \left( \frac{M}{B} \right)_{\text{efwa},t-1} + \beta_5 \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_t + \beta_6 \left( \frac{M}{B} \right)_{t-1} + \beta_7 \left( \frac{\text{PPE}}{A} \right)_{t-1} + \beta_8 \left( \frac{\text{EBITDA}}{A} \right)_{t-1} + \beta_9 \text{Ln}(S)_{t-1} + \epsilon_t.
\]

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity and is expressed in percentage terms. Net insider selling over trading volume is total insider selling minus purchasing all divided by trading volume. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10 or the absolute value of net insider selling over trading volume over trading volume is over 0.5. Net insider trading over trading volume and market-to-book are defined in two ways. The first is a weighted average net insider selling over trading volume, and market-to-book, from year 1987 to year \( t \) for net insider selling and to \( t-1 \) for market-to-book. The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. The second is the net insider selling over trading volume and market-to-book ratio, respectively, in year \( t \) and year \( t-1 \). Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. Dummy1 variable equals one for companies whose insiders are net sellers, zero otherwise. Dummy2 variable equals one for equity issuing, insider selling companies that consistently under performed the control portfolios in the subsequent period, zero otherwise. \( t \)-statistics are in parentheses.

<table>
<thead>
<tr>
<th></th>
<th>Book Leverage</th>
<th>Market Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>5,163</td>
<td>5,163</td>
</tr>
<tr>
<td>Ins.Sell/Trad.Vol.(_{\text{efwa},t})</td>
<td>-5.60 (-2.55)</td>
<td>-6.50 (-2.92)</td>
</tr>
<tr>
<td>M/B(_{\text{efwa},t-1})</td>
<td>-5.65 (-10.73)</td>
<td>-6.88 (-12.88)</td>
</tr>
<tr>
<td>Dum(<em>{1,i,t}) (M/B.)(</em>{\text{efwa},t-1})</td>
<td>-0.80 (-2.65)</td>
<td>-1.57 (-5.12)</td>
</tr>
<tr>
<td>Dum(<em>{2,j,t}) (M/B.)(</em>{\text{efwa},t-1})</td>
<td>-3.94 (-7.09)</td>
<td>-3.84 (-6.79)</td>
</tr>
<tr>
<td>Ins.Sell/Trad.Vol.(_t)</td>
<td>-4.97 (-2.45)</td>
<td>-14.31 (-6.95)</td>
</tr>
<tr>
<td>M/B(_{t-1})</td>
<td>1.80 (4.02)</td>
<td>-3.09 (-6.79)</td>
</tr>
<tr>
<td>PPE/A(_{t-1}) %</td>
<td>0.03 (2.79)</td>
<td>0.06 (5.99)</td>
</tr>
<tr>
<td>EBITDA/A(_{t-1}) %</td>
<td>-0.54 (-14.32)</td>
<td>-0.72 (-18.61)</td>
</tr>
<tr>
<td>Log(S)(_{t-1})</td>
<td>3.48 (26.99)</td>
<td>1.75 (13.37)</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.26</td>
<td>0.45</td>
</tr>
</tbody>
</table>
Table 12
Correlation between Measures of Adverse Selection
Pearson’s correlation coefficient between measures of adverse selection, in years 1987 to 2000. The two measures of adverse selection are measures of the adverse selection component of the bid-ask spread. The first measure ($\lambda$) of the adverse selection component of the spread follows Huang and Stoll (1999) model. The second measure (R-square) is based on a modified version of Venkatesh and Chiang (1986) model.

<table>
<thead>
<tr>
<th>N</th>
<th>Adverse Selection Component of the spread: Model I ($\lambda$)</th>
<th>Adverse Selection Component of the spread: Model II (R-square)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12,799</td>
<td>1</td>
<td>-0.02**</td>
</tr>
</tbody>
</table>

Component of the spread:

- Model I ($\lambda$)

Component of the spread:

- Model II (R-square)

** Statistically significant at the 5% level.
Table 13
Correlation between Market-to-Book and Measures of Adverse Selection

Pearson’s correlation coefficient between market-to-book and measures of adverse selection, in years 1987 to 2000. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10. The two measures of adverse selection are measures of the adverse selection component of the bid-ask spread. The first measure ( $\lambda$ ) of the adverse selection component of the spread follows Huang and Stoll (1999) model. The second measure (R-square) is based on a modified version of Venkatesh and Chiang (1986) model.

<table>
<thead>
<tr>
<th>Adverse Selection Component of the spread: Model I ( $\lambda$ )</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Correlation with Market-to-Book</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adverse Selection Component of the spread: Model II (R-square)</td>
<td>4,442</td>
<td>0.36</td>
<td>0.30</td>
<td>0.08***</td>
</tr>
</tbody>
</table>

* Statistically significant at the 10% level.
*** Statistically significant at the 1% level.
### Table 14
Determinants of Annual Change in Leverage and Adverse Selection Component of the Spread: Model I

OLS regressions of change in book and market leverage on the adverse selection component of the bid-ask spread ($\hat{\lambda}$) following Huang and Stoll (1994) model, market-to-book ratio, fixed assets, profitability, firm size, and lagged leverage.

$$
\left(\frac{D_t}{A_t}\right) - \left(\frac{D_{t-1}}{A_{t-1}}\right) = \alpha + \beta_1(\hat{\lambda}_{t-1}) + \beta_2\left(\frac{M}{B}\right)_{t-1} + \beta_3\left(\frac{PPE}{A}\right)_{t-1} + \beta_4\left(\frac{EBITDA}{A}\right)_{t-1} + \beta_5\ln(S)_{t-1} + \beta_6\left(\frac{D}{A}\right)_{t-1} + \epsilon_t.
$$

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity and is expressed in percentage terms. The adverse selection component of the bid-ask spread ($\hat{\lambda}$) follows Huang and Stoll (1994) model, and is measured at time $t-1$. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10. Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. We do not report $\alpha$ and $\beta_6$. We exclude firm year outliers. The book change in leverage is in Panel A. The market change in leverage is in Panel B. $t$-statistics are in parentheses.

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>$\hat{\lambda}$</th>
<th>$t(\hat{\beta}_1)$</th>
<th>$\frac{M}{B}$</th>
<th>$t(\hat{\beta}_2)$</th>
<th>$\frac{PPE}{A}$</th>
<th>$t(\hat{\beta}_3)$</th>
<th>$\frac{EBITDA}{A}$</th>
<th>$t(\hat{\beta}_4)$</th>
<th>$\ln(S)$</th>
<th>$t(\hat{\beta}_5)$</th>
<th>$\frac{D}{A}$</th>
<th>$t(\hat{\beta}_6)$</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987-2000</td>
<td>17,293</td>
<td>-1.16</td>
<td>(-3.97)</td>
<td>-0.44</td>
<td>(-4.52)</td>
<td>0.01</td>
<td>(4.05)</td>
<td>-0.07</td>
<td>(-5.97)</td>
<td>0.34</td>
<td>(7.38)</td>
<td>0.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Panel A: Change in Book Leverage %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1987-2000</td>
<td>17,293</td>
<td>-1.84</td>
<td>(-5.06)</td>
<td>0.32</td>
<td>(2.25)</td>
<td>0.03</td>
<td>(7.26)</td>
<td>-0.18</td>
<td>(-12.14)</td>
<td>0.04</td>
<td>(0.69)</td>
<td>0.09</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 15
Determinants of Annual Change in Leverage and Adverse Selection Component of the Spread: Model II

OLS regressions of change in book and market leverage on the adverse selection component of the bid-ask spread (R-square) based on a modified version of Venkatesh and Chiang (1986) model, market-to-book ratio, fixed assets, profitability, firm size, and lagged leverage.

\[
\left( \frac{D}{A} \right)_t - \left( \frac{D}{A} \right)_{t-1} = \alpha + \beta_1 (R^2)_{t-1} + \beta_2 \left( \frac{M}{B} \right)_{t-1} + \beta_3 \left( \frac{PPE}{A} \right)_{t-1} + \beta_4 \left( \frac{EBITDA}{A} \right)_{t-1} + \beta_5 \ln(S)_{t-1} + \beta_6 \left( \frac{D}{A} \right)_{t-1} + \varepsilon_t.
\]

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity and is expressed in percentage terms. The adverse selection component of the bid-ask spread (R-square) is based on a modified version of Venkatesh and Chiang (1986) model, and is measured at time \( t-1 \). The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10. Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. We do not report \( \alpha \) and \( \beta_6 \). We exclude firm year outliers. The book change in leverage is in Panel A. The market change in leverage is in Panel B. \( t \)-statistics are in parentheses.

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>( R^2 ) ( t(\beta_1) )</th>
<th>( \frac{M}{B} ) ( t(\beta_2) )</th>
<th>( \frac{PPE}{A} ) ( t(\beta_3) )</th>
<th>( \frac{EBITDA}{A} ) ( t(\beta_4) )</th>
<th>( \ln(S) ) ( t(\beta_5) )</th>
<th>( R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987-2000</td>
<td>13,590</td>
<td>1.07 (1.74)</td>
<td>-0.62 (-5.99)</td>
<td>0.03 (5.79)</td>
<td>-0.10 (-7.31)</td>
<td>0.45 (6.18)</td>
<td>0.08</td>
</tr>
<tr>
<td>Panel B: Change in Market Leverage %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1987-2000</td>
<td>13,590</td>
<td>1.56 (2.03)</td>
<td>0.09 (0.62)</td>
<td>0.04 (7.63)</td>
<td>-0.17 (-10.19)</td>
<td>0.31 (3.45)</td>
<td>0.09</td>
</tr>
</tbody>
</table>
Table 16
Components of Annual Change in Leverage and Adverse Selection Component of the Spread: Model I

OLS regressions of components of changes in book leverage on the adverse selection component of the bid-ask spread ($\lambda$) following Huang and Stoll (1999) model, market-to-book ratio, fixed assets, profitability, firm size, and lagged leverage.

$$-\left(\frac{e}{A}\right)_t = \alpha + \beta_1(\lambda)_{t-1} + \beta_2\left(\frac{M}{B}\right)_{t-1} + \beta_3\left(\frac{PPE}{A}\right)_{t-1} + \beta_4\left(\frac{EBITDA}{A}\right)_{t-1} + \beta_5\ln(S)_{t-1} + \beta_6\left(\frac{D}{A}\right)_{t-1} + \epsilon_t,$$

$$-\left(\frac{\Delta RE}{A}\right)_t = \alpha + \beta_1(\lambda)_{t-1} + \beta_2\left(\frac{M}{B}\right)_{t-1} + \beta_3\left(\frac{PPE}{A}\right)_{t-1} + \beta_4\left(\frac{EBITDA}{A}\right)_{t-1} + \beta_5\ln(S)_{t-1} + \beta_6\left(\frac{D}{A}\right)_{t-1} + \epsilon_t,$$

$$-\left[E_{t-1}\left(\frac{1}{A_t} - \frac{1}{A_{t-1}}\right)\right] = \alpha + \beta_1(\lambda)_{t-1} + \beta_2\left(\frac{M}{B}\right)_{t-1} + \beta_3\left(\frac{PPE}{A}\right)_{t-1} + \beta_4\left(\frac{EBITDA}{A}\right)_{t-1} + \beta_5\ln(S)_{t-1} + \beta_6\left(\frac{D}{A}\right)_{t-1} + \epsilon_t,$$

Equity issues are defined as the change in book equity, minus the change in retained earnings, divided by assets. Newly retained earnings are defined as the change in retained earnings divided by assets. Debt issues are defined as the residual change in assets divided by assets. The adverse selection component of the bid-ask spread ($\lambda$) follows Huang and Stoll (1994) model, and is measured at time $t-1$. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10. Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. Book value leverage is book debt to total assets. We exclude firm year outliers. $t$-statistics are in parentheses.

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>$\lambda_{t-1}$</th>
<th>$M/B_{t-1}$</th>
<th>$PPE/A_{t-1}$ %</th>
<th>$EBITDA/A_{t-1}$ %</th>
<th>Log(S)$_{t-1}$</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987-2000</td>
<td>13,572</td>
<td>-1.56 (-2.96)</td>
<td>-2.18 (-16.71)</td>
<td>-0.01 (-0.55)</td>
<td>0.10 (6.64)</td>
<td>1.30 (21.73)</td>
<td>0.05</td>
</tr>
<tr>
<td>1987-2000</td>
<td>13,572</td>
<td>-0.14 (-0.30)</td>
<td>-0.98 (-8.12)</td>
<td>0.01 (2.08)</td>
<td>-0.25 (-18.51)</td>
<td>-0.17 (-3.13)</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1987-2000</td>
<td>13,572</td>
<td>-1.45 (-0.18)</td>
<td>2.77 (1.37)</td>
<td>-0.11 (-1.49)</td>
<td>0.02 (0.07)</td>
<td>1.77 (1.90)</td>
<td>0.01</td>
</tr>
</tbody>
</table>
Table 17

Components of Annual Change in Leverage and Adverse Selection Component of the Spread: Model II

OLS regressions of components of changes in book leverage on the adverse selection component of the bid-ask spread (R-square) based on a modified version of Venkatesh and Chiang (1986) model, market-to-book ratio, fixed assets, profitability, firm size, and lagged leverage.

\[
-
\left( \frac{e}{A} \right)_t = \alpha + \beta_1 \left( R^2 \right)_{t-1} + \beta_2 \left( \frac{M}{B} \right)_{t-1} + \beta_3 \left( \frac{PPE}{A} \right)_{t-1} + \beta_4 \left( \frac{EBITDA}{A} \right)_{t-1} + \beta_5 \ln(S)_{t-1} + \beta_6 \left( \frac{D}{A} \right)_{t-1} + \epsilon_t
\]

\[
-
\left( \frac{\Delta RE}{A} \right)_t = \alpha + \beta_1 \left( R^2 \right)_{t-1} + \beta_2 \left( \frac{M}{B} \right)_{t-1} + \beta_3 \left( \frac{PPE}{A} \right)_{t-1} + \beta_4 \left( \frac{EBITDA}{A} \right)_{t-1} + \beta_5 \ln(S)_{t-1} + \beta_6 \left( \frac{D}{A} \right)_{t-1} + \epsilon_t
\]

\[
-
\left[ E_{t-1} \left( \frac{1}{A_t} - \frac{1}{A_{t-1}} \right) \right] = \alpha + \beta_1 \left( R^2 \right)_{t-1} + \beta_2 \left( \frac{M}{B} \right)_{t-1} + \beta_3 \left( \frac{PPE}{A} \right)_{t-1} + \beta_4 \left( \frac{EBITDA}{A} \right)_{t-1} + \beta_5 \ln(S)_{t-1} + \beta_6 \left( \frac{D}{A} \right)_{t-1} + \epsilon_t
\]

Equity issues are defined as the change in book equity, minus the change in retained earnings, divided by assets. Newly retained earnings are defined as the change in retained earnings divided by assets. Debt issues are defined as the residual change in assets divided by assets. The adverse selection component of the bid-ask spread (R-square) is based on a modified version of Venkatesh and Chiang (1986) model, and is measured at time \( t-1 \). The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10. Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. Book value leverage is book debt to total assets. We exclude firm year outliers. \( t \)-statistics are in parentheses.

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>( R^2_{t-1} )</th>
<th>M/B ( _{t-1} )</th>
<th>PPE/A ( _{t-1} ) %</th>
<th>EBITDA/A ( _{t-1} ) %</th>
<th>Log(S) ( _{t-1} )</th>
<th>( R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987-2000</td>
<td>11,213</td>
<td>2.28 (1.99)</td>
<td>-3.14 (-22.33)</td>
<td>0.01 (0.15)</td>
<td>0.13 (7.67)</td>
<td>1.57 (16.26)</td>
<td>0.07</td>
</tr>
</tbody>
</table>

Panel B: Change in Book Leverage Due to Newly Retained Earnings %

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>( R^2_{t-1} )</th>
<th>M/B ( _{t-1} )</th>
<th>PPE/A ( _{t-1} ) %</th>
<th>EBITDA/A ( _{t-1} ) %</th>
<th>Log(S) ( _{t-1} )</th>
<th>( R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987-2000</td>
<td>11,213</td>
<td>0.28 (0.28)</td>
<td>-1.04 (-8.47)</td>
<td>0.01 (2.13)</td>
<td>-0.27 (-17.87)</td>
<td>-0.38 (-4.51)</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Panel C: Change in Book Leverage Due to Growth in Assets %

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>( R^2_{t-1} )</th>
<th>M/B ( _{t-1} )</th>
<th>PPE/A ( _{t-1} ) %</th>
<th>EBITDA/A ( _{t-1} ) %</th>
<th>Log(S) ( _{t-1} )</th>
<th>( R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987-2000</td>
<td>11,213</td>
<td>-6.52 (-1.11)</td>
<td>2.71 (3.78)</td>
<td>-0.01 (-0.11)</td>
<td>0.06 (0.69)</td>
<td>0.38 (0.78)</td>
<td>0.01</td>
</tr>
</tbody>
</table>
Table 18
Leverage, Subsequent Performance, and Adverse Component of the Spread: Model I
OLS regressions of book and market leverage on the ratio of net insider selling over trading volume, market-to-book ratio, fixed assets, profitability, and firm size.

\[
\left( \frac{D}{A} \right)_t = \alpha + \beta_1 \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_{efwa,t} + \beta_2 \left( \frac{M}{B} \right)_{efwa,t-1} + \beta_3 \text{Dum}_t \left( \frac{M}{B} \right)_{efwa,t-1} + \beta_4 \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_t + \beta_5 \left( \frac{M}{B} \right)_{t-1} + \beta_6 \left( \frac{\text{PPE}}{A} \right)_{t-1} + \beta_7 \left( \frac{\text{EBITDA}}{A} \right)_{t-1} + \beta_8 \ln(S)_{t-1} + \epsilon_t
\]

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity and is expressed in percentage terms. Net insider selling over trading volume is total insider selling minus purchasing all divided by trading volume. We examine trades by company executives, officers, directors, and controlling persons. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10 or the absolute value of net insider selling over trading volume is above 0.5. Net insider trading over trading volume and market-to-book are defined in two ways. The first is a weighted average net insider selling over trading volume, and market-to-book, from year 1987 to year \( t \) for net insider selling and to \( t-1 \) for market-to-book. The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. The second is the net insider selling over trading volume and market-to-book ratio, respectively, in year \( t-1 \) and year \( t \). Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. Dummy variable equals one for companies in the upper quartile, based on the ranking by the weighted average of 1 over the adverse selection component of the bid-ask spread: Model I \((1/\lambda)\), zero otherwise. \( t \)-statistics are in parentheses.
<table>
<thead>
<tr>
<th></th>
<th>Book Leverage</th>
<th>Market Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>5,154</td>
<td>5,154</td>
</tr>
<tr>
<td>$e_{fwa,t}$</td>
<td>-6.41</td>
<td>-7.53</td>
</tr>
<tr>
<td></td>
<td>(-2.90)</td>
<td>(-3.35)</td>
</tr>
<tr>
<td>M/B $e_{fwa,t-1}$</td>
<td>-6.49</td>
<td>-8.35</td>
</tr>
<tr>
<td></td>
<td>(-13.93)</td>
<td>(-17.63)</td>
</tr>
<tr>
<td>Dum$<em>i$ ( M/B) $e</em>{fwa,t-1}$</td>
<td>0.49</td>
<td>0.30</td>
</tr>
<tr>
<td></td>
<td>(1.20)</td>
<td>(0.72)</td>
</tr>
<tr>
<td>$t$</td>
<td>(-4.57)</td>
<td>(-10.65)</td>
</tr>
<tr>
<td>M/B $_{t-1}$</td>
<td>1.83</td>
<td>-3.13</td>
</tr>
<tr>
<td></td>
<td>(4.06)</td>
<td>(-6.83)</td>
</tr>
<tr>
<td>PPE/A $_{t-1}$ %</td>
<td>0.03</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>(2.77)</td>
<td>(5.92)</td>
</tr>
<tr>
<td>EBITDA/A $_{t-1}$ %</td>
<td>-0.54</td>
<td>-0.71</td>
</tr>
<tr>
<td></td>
<td>(-14.04)</td>
<td>(-18.16)</td>
</tr>
<tr>
<td>Log(S) $_{t-1}$</td>
<td>3.42</td>
<td>1.66</td>
</tr>
<tr>
<td></td>
<td>(26.50)</td>
<td>(12.61)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.25</td>
<td>0.44</td>
</tr>
</tbody>
</table>
Table 19
Leverage, Subsequent Performance, and Adverse Component of the Spread: Model II
OLS regressions of book and market leverage on the ratio of net insider selling over trading volume, market-to-book ratio, fixed assets, profitability, and firm size.

\[
\left( \frac{D}{A} \right)_t = \alpha + \beta_1 \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_{\text{efa}1,1} + \beta_2 \left( \frac{M}{B} \right)_{\text{efa}1,1} + \beta_3 \text{Dum}_t \left( \frac{M}{B} \right)_{\text{efa}1,1-1} + \beta_4 \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_{t-1} \\
+ \beta_5 \left( \frac{M}{B} \right)_{t-1} + \beta_6 \left( \frac{\text{PPE}}{A} \right)_{t-1} + \beta_7 \left( \frac{\text{EBITDA}}{A} \right)_{t-1} + \beta_8 \text{Ln}(S)_{t-1} + \varepsilon_t,
\]

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity and is expressed in percentage terms. Net insider selling over trading volume is total insider selling minus purchasing all divided by trading volume. We examine trades by company executives, officers, directors, and controlling persons. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10 or the absolute value of net insider selling over trading volume is above 0.5. Net insider trading over trading volume and market-to-book are defined in two ways. The first is a weighted average net insider selling over trading volume, and market-to-book, from year 1987 to year \( t \) for net insider selling and to \( t-1 \) for market-to-book. The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. The second is the net insider selling over trading volume and market-to-book ratio, respectively, in year \( t-1 \) and year \( t \). Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. Dummy variable equals one for companies in the upper quartile, based on the ranking by the weighted average adverse selection component of the bid-ask spread: Model II (R-square), zero otherwise. \( t \)-statistics are in parentheses.
<table>
<thead>
<tr>
<th></th>
<th>Book Leverage</th>
<th>Market Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>5,154</td>
</tr>
<tr>
<td></td>
<td>Ins.Sell/Trad.Vol. ( _{efwa,t} )</td>
<td>-6.35 (-2.88)</td>
</tr>
<tr>
<td></td>
<td>M/B ( _{effa,t−1} )</td>
<td>-6.41 (-13.74)</td>
</tr>
<tr>
<td></td>
<td>Dum ( _1 ( M/B ) ( _{efwa,t} )</td>
<td>-0.44 (-1.06)</td>
</tr>
<tr>
<td></td>
<td>Ins.Sell/Trad.Vol. ( _{t−1} )</td>
<td>-8.34 (-4.53)</td>
</tr>
<tr>
<td></td>
<td>M/B ( _{t−1} )</td>
<td>1.82 (4.05)</td>
</tr>
<tr>
<td></td>
<td>PPE/A ( _{t−1} ) %</td>
<td>0.03 (2.66)</td>
</tr>
<tr>
<td></td>
<td>EBITDA/A ( _{t−1} ) %</td>
<td>-0.54 (-14.14)</td>
</tr>
<tr>
<td></td>
<td>Log(S) ( _{t−1} )</td>
<td>3.39 (25.73)</td>
</tr>
<tr>
<td></td>
<td>( R^2 )</td>
<td>0.25</td>
</tr>
</tbody>
</table>
Table 20
Determinants of Leverage and Underpricing
OLS regressions of book and market leverage on the market-to-book ratio, fixed assets, profitability, and firm size.

\[
\left( \frac{D}{A} \right)_t = \alpha + \beta_1 \left( \frac{M}{B} \right)_{e,f,w,a,t-1} + \beta_2 \text{Dum}_t \left( \frac{M}{B} \right)_{e,f,w,a,t-1} + \beta_3 \left( \frac{M}{B} \right)_{t-1} + \beta_4 \left( \frac{PPE}{A} \right)_{t-1} \\
+ \beta_5 \left( \frac{EBITDA}{A} \right)_{t-1} + \beta_6 \ln(S)_{t-1} + \varepsilon_t,
\]

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity and is expressed in percentage terms. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10. Market-to-book is defined in two ways. The first is a weighted average market-to-book from 1987 to year \( t-1 \). The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. The second is the market-to-book ratio, in year \( t-1 \). Dummy variable equals one for companies in the upper quartile, based on the underpricing ranking, zero otherwise. Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. \( t \)-statistics are in parentheses.

<table>
<thead>
<tr>
<th></th>
<th>Book Leverage</th>
<th>Market Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>27,8661</td>
</tr>
<tr>
<td></td>
<td></td>
<td>27,866</td>
</tr>
<tr>
<td>M/B_{e,f,w,a,t-1}</td>
<td>-5.76</td>
<td>-7.47</td>
</tr>
<tr>
<td></td>
<td>(-25.94)</td>
<td>(-32.28)</td>
</tr>
<tr>
<td>Dum_{t} (M/B)_{e,f,w,a,t-1}</td>
<td>0.69</td>
<td>0.99</td>
</tr>
<tr>
<td></td>
<td>(0.43)</td>
<td>(0.60)</td>
</tr>
<tr>
<td>M/B_{t-1}</td>
<td>0.52</td>
<td>-5.45</td>
</tr>
<tr>
<td></td>
<td>(2.47)</td>
<td>(-24.82)</td>
</tr>
<tr>
<td>PPE/A_{t-1} %</td>
<td>0.03</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>(5.95)</td>
<td>(12.07)</td>
</tr>
<tr>
<td>EBITDA/A_{t-1} %</td>
<td>-0.41</td>
<td>-0.66</td>
</tr>
<tr>
<td></td>
<td>(-25.45)</td>
<td>(-39.35)</td>
</tr>
<tr>
<td>Log(S)_{t-1}</td>
<td>2.69</td>
<td>1.03</td>
</tr>
<tr>
<td></td>
<td>(46.48)</td>
<td>(17.03)</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.17</td>
<td>0.36</td>
</tr>
</tbody>
</table>
Table 21
Leverage and Adverse Selection Component of the Spread: Model I

OLS regressions of book and market leverage on the ratio of 1 over $\hat{\lambda}$ (adverse selection component of the bid-ask spread: model I), market-to-book ratio, fixed assets, profitability, and firm size.

$$
\left( \frac{D}{A} \right)_{t} = \alpha + \beta_1 \left( \frac{1}{\hat{\lambda}} \right)_{t-1} + \beta_2 \left( \frac{M}{B} \right)_{t-1} + \beta_3 \left( \frac{1}{\hat{\lambda}} \right)_{t-1} + \beta_4 \left( \frac{M}{B} \right)_{t-1} + \beta_5 \left( \frac{PPE}{A} \right)_{t-1} + \beta_6 \left( \frac{EBITDA}{A} \right)_{t-1} + \beta_7 Ln(S)_{t-1} + \epsilon_t
$$

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity and is expressed in percentage terms. The adverse selection component of the bid-ask spread ($\hat{\lambda}$) follows Huang and Stoll (1994) model. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10. 1 over $\hat{\lambda}$ and market-to-book are defined in two ways. The first is a weighted average of 1 over $\hat{\lambda}$, and market-to-book, from year 1987 to year $t-1$. The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. The second is 1 over $\hat{\lambda}$, and market-to-book ratio, in year $t-1$. Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. $t$-statistics are in parentheses.

<table>
<thead>
<tr>
<th></th>
<th>Book Leverage</th>
<th>Market Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>12,390</td>
<td>12,390</td>
</tr>
<tr>
<td>$\frac{1}{\hat{\lambda}}_{\text{efwa, } t-1}$</td>
<td>-0.01 (-1.33)</td>
<td>-0.01 (-0.04)</td>
</tr>
<tr>
<td>$\frac{M}{B}_{t-1}$</td>
<td>-5.32 (-15.44)</td>
<td>-6.84 (-19.28)</td>
</tr>
<tr>
<td>$\frac{1}{\hat{\lambda}}_{t-1}$</td>
<td>0.01 (0.61)</td>
<td>0.01 (0.51)</td>
</tr>
<tr>
<td>M/B$_{t-1}$</td>
<td>0.78 (2.41)</td>
<td>-5.57 (-16.66)</td>
</tr>
<tr>
<td>PPE/A$_{t-1}$%</td>
<td>0.05 (7.86)</td>
<td>0.08 (11.45)</td>
</tr>
<tr>
<td>EBITDA/A$_{t-1}$%</td>
<td>-0.45 (-18.85)</td>
<td>-0.67 (-27.30)</td>
</tr>
<tr>
<td>Log(S)$_{t-1}$</td>
<td>2.69 (30.44)</td>
<td>1.03 (11.31)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.16</td>
<td>0.36</td>
</tr>
</tbody>
</table>
Table 22
Leverage and Adverse Selection Component of the Spread: Model II

OLS regressions of book and market leverage on \( R^2 \) (adverse selection component of the bid-ask spread: model II), market-to-book ratio, fixed assets, profitability, and firm size.

\[
\left( \frac{D}{A} \right)_t = \alpha + \beta_1 \left( R^2 \right)_{efwa,t-1} + \beta_2 \left( \frac{M}{B} \right)_{efwa,t-1} + \beta_3 \left( R^2 \right)_{t-1} + \beta_4 \left( \frac{M}{B} \right)_{t-1} + \beta_5 \left( \frac{PPE}{A} \right)_{t-1} \\
+ \beta_6 \left( \frac{EBITDA}{A} \right)_{t-1} + \beta_7 \ln(S)_{t-1} + \varepsilon_t
\]

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity and is expressed in percentage terms. The adverse selection component of the bid-ask spread (Rsquare) is based on a modified version of Venkatesh and Chiang (1986) model. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10. Rsquare and market-to-book are defined in two ways. The first is a weighted average Rsquare, and market-to-book, from year 1987 to year \( t-1 \). The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. The second is Rsquare, and market-to-book ratio, in year \( t-1 \). Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. \( t \)-statistics are in parentheses.

<table>
<thead>
<tr>
<th></th>
<th>Book Leverage</th>
<th>Market Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>9,705</td>
<td>9,705</td>
</tr>
<tr>
<td>Rsquare ( _{efwa,t-1} )</td>
<td>-0.05</td>
<td>6.89</td>
</tr>
<tr>
<td>( t-1 )</td>
<td>(-0.03)</td>
<td>(3.97)</td>
</tr>
<tr>
<td>M/B ( _{efwa,t-1} )</td>
<td>-5.71</td>
<td>-6.95</td>
</tr>
<tr>
<td>( t-1 )</td>
<td>(-16.67)</td>
<td>(-19.26)</td>
</tr>
<tr>
<td>M/B ( _{t-1} )</td>
<td>0.08</td>
<td>-4.78</td>
</tr>
<tr>
<td>( t-1 )</td>
<td>(0.24)</td>
<td>(-13.60)</td>
</tr>
<tr>
<td>PPE/A ( _{t-1} ) %</td>
<td>0.10</td>
<td>0.11</td>
</tr>
<tr>
<td>( t-1 )</td>
<td>(11.64)</td>
<td>(12.68)</td>
</tr>
<tr>
<td>EBITDA/A ( _{t-1} ) %</td>
<td>-0.41</td>
<td>-0.62</td>
</tr>
<tr>
<td>( t-1 )</td>
<td>(-16.39)</td>
<td>(-23.35)</td>
</tr>
<tr>
<td>Log(S) ( _{t-1} )</td>
<td>2.68</td>
<td>1.50</td>
</tr>
<tr>
<td>( t-1 )</td>
<td>(20.18)</td>
<td>(10.70)</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.17</td>
<td>0.35</td>
</tr>
</tbody>
</table>
Table 23
Leverage, Size, and Adverse Selection Component of the Spread: Model I

OLS regressions of book and market leverage on the ratio of 1 over $\hat{\lambda}$ (adverse selection component of the bid-ask spread: model I), market-to-book ratio, fixed assets, profitability, and firm size.

\[
\left( \frac{D}{A} \right)_t = \alpha + \beta_1 \left( \frac{1}{\lambda} \right)_{efw,t-1} + \beta_2 Dum_i \left( \frac{1}{\lambda} \right)_{efw,t-1} + \beta_3 \left( \frac{M}{B} \right)_{efw,t-1} + \beta_4 \left( \frac{1}{\lambda} \right)_{t-1} + \beta_5 \left( \frac{M}{B} \right)_{t-1} + \beta_6 \left( \frac{PPE}{A} \right)_{t-1} + \beta_7 \left( \frac{EBITDA}{A} \right)_{t-1} + \beta_8 \ln(S)_{t-1} + \varepsilon_t
\]

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity and is expressed in percentage terms. The adverse selection component of the bid-ask spread ($\hat{\lambda}$ ) follows Huang and Stoll (1994) model. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10. $1/\hat{\lambda}$ and market-to-book are defined in two ways. The first is a weighted average $1/\hat{\lambda}$, and market-to-book, from year 1987 to year $t-1$. The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. The second is $1/\hat{\lambda}$, and market-to-book ratio, in year $t-1$. Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. Dummy variable equals one for the lower quartile (smaller companies), zero otherwise. $t$-statistics are in parentheses.

<table>
<thead>
<tr>
<th></th>
<th>Book Leverage</th>
<th>Market Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>12,390</td>
<td>12,390</td>
</tr>
<tr>
<td>$1/\hat{\lambda}_{efw,t-1}$</td>
<td>-0.01\hspace{1cm}(-1.79)</td>
<td>-0.01\hspace{1cm}(-0.52)</td>
</tr>
<tr>
<td>$Dum_i\left(1/\hat{\lambda}\right)_{efw,t-1}$</td>
<td>0.03\hspace{1cm}(4.27)</td>
<td>0.03\hspace{1cm}(4.34)</td>
</tr>
<tr>
<td>$M/B_{efw,t-1}$</td>
<td>-5.29\hspace{1cm}(-15.34)</td>
<td>-6.81\hspace{1cm}(-19.19)</td>
</tr>
<tr>
<td>$1/\hat{\lambda}_{t-1}$</td>
<td>0.01\hspace{1cm}(0.72)</td>
<td>0.01\hspace{1cm}(0.63)</td>
</tr>
<tr>
<td>$M/B_{t-1}$</td>
<td>0.78\hspace{1cm}(2.40)</td>
<td>-5.57\hspace{1cm}(-16.69)</td>
</tr>
<tr>
<td>$PPE/A_{t-1}$ %</td>
<td>0.06\hspace{1cm}(7.87)</td>
<td>0.08\hspace{1cm}(11.46)</td>
</tr>
<tr>
<td>$EBITDA/A_{t-1}$ %</td>
<td>-0.45\hspace{1cm}(-18.80)</td>
<td>-0.67\hspace{1cm}(-27.26)</td>
</tr>
<tr>
<td>Log(S)$_{t-1}$</td>
<td>2.72\hspace{1cm}(30.69)</td>
<td>1.06\hspace{1cm}(11.61)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.16</td>
<td>0.36</td>
</tr>
</tbody>
</table>
Table 24
Leverage, Size, and Adverse Selection Component of the Spread: Model II

OLS regressions of book and market leverage on R-square (adverse selection component of the bid-ask spread: model II), market-to-book ratio, fixed assets, profitability, and firm size:

\[
\left( \frac{D}{A} \right)_{t} = \alpha + \beta_1 \left( R^2 \right)_{efwaw,t-1} + \beta_2 \text{Dum}_{t-1} \left( R^2 \right)_{efwaw,t-1} + \beta_3 \left( \frac{M}{B} \right)_{efwaw,t-1} + \beta_4 \left( R^2 \right)_{t-1} + \beta_5 \left( \frac{M}{B} \right)_{t-1} + \beta_6 \left( \frac{PPE}{A} \right)_{t-1} + \beta_7 \left( \frac{EBITDA}{A} \right)_{t-1} + \beta_8 \text{Ln}(S)_{t-1} + \epsilon_t,
\]

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity and is expressed in percentage terms. The adverse selection component of the bid-ask spread (R-square) is based on a modified version of Venkatesh and Chiang (1986) model. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10. Rsquare and market-to-book are defined in two ways. The first is a weighted average Rsquare, and market-to-book, from year 1987 to year \( t-1 \). The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. The second is Rsquare, and market-to-book ratio, in year \( t-1 \). Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. Dummy variable equals one for the lower quartile (smaller companies), zero otherwise. t-statistics are in parentheses.

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
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<td>N</td>
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<td>9,705</td>
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<tr>
<td>Rsquare ( efwaw,t-1 )</td>
<td>-4.87</td>
<td>0.86</td>
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<tr>
<td></td>
<td>(-2.89)</td>
<td>(0.49)</td>
</tr>
<tr>
<td>Dum ( t-1 ) (Rsquare) ( efwaw,t-1 )</td>
<td>23.51</td>
<td>29.42</td>
</tr>
<tr>
<td></td>
<td>(11.83)</td>
<td>(14.08)</td>
</tr>
<tr>
<td>M/B ( efwaw,t-1 )</td>
<td>-5.48</td>
<td>-6.67</td>
</tr>
<tr>
<td></td>
<td>(-16.10)</td>
<td>(-18.64)</td>
</tr>
<tr>
<td>Rsquare ( t-1 )</td>
<td>5.32</td>
<td>1.43</td>
</tr>
<tr>
<td></td>
<td>(3.84)</td>
<td>(0.98)</td>
</tr>
<tr>
<td>M/B ( t-1 )</td>
<td>0.20</td>
<td>-4.63</td>
</tr>
<tr>
<td></td>
<td>(0.61)</td>
<td>(-13.29)</td>
</tr>
<tr>
<td>PPE/A ( t-1 ) %</td>
<td>0.10</td>
<td>0.11</td>
</tr>
<tr>
<td></td>
<td>(11.72)</td>
<td>(12.80)</td>
</tr>
<tr>
<td>EBITDA/A ( t-1 ) %</td>
<td>-0.39</td>
<td>-0.59</td>
</tr>
<tr>
<td></td>
<td>(-15.66)</td>
<td>(-22.57)</td>
</tr>
<tr>
<td>Log(S) ( t-1 )</td>
<td>2.97</td>
<td>1.87</td>
</tr>
<tr>
<td></td>
<td>(22.17)</td>
<td>(13.24)</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.18</td>
<td>0.36</td>
</tr>
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</table>
Table 25
Leverage, Subsequent Performance, and Adverse Component of the Spread: Model I

OLS regressions of book and market leverage on the ratio of net insider selling over trading volume, market-to-book ratio, fixed assets, profitability, and firm size.

\[
\frac{D}{A} = \alpha + \beta_1 \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_{t-1} + \beta_2 \left( \frac{M}{B} \right)_{t-1} + \beta_3 \text{Dum}_t \left( \frac{M}{B} \right)_{t-1} + \beta_4 \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_{t} + \beta_5 \left( \frac{M}{B} \right)_{t} + \beta_6 \left( \frac{PPE}{A} \right)_{t-1} + \beta_7 \left( \frac{\text{EBITDA}}{A} \right)_{t-1} + \beta_8 \ln(S)_{t-1} + \epsilon_t
\]

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity and is expressed in percentage terms. Net insider selling over trading volume is total insider selling minus purchasing all divided by trading volume. We examine trades by company executives, officers, directors, and controlling persons. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10 or the absolute value of net insider selling over trading volume is above 0.5. Net insider trading over trading volume and market-to-book are defined in two ways. The first is a weighted average net insider selling over trading volume, and market-to-book, from year 1987 to year \( t \) for net insider selling and to \( t-1 \) for market-to-book. The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. The second is the net insider selling over trading volume and market-to-book ratio, respectively, in year \( t-1 \) and year \( t \). Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. Dummy variable equals one for companies in the upper quartile, based on the ranking by the weighted average adverse selection component of the bid-ask spread: Model I (\( \lambda \)), zero otherwise. \( t \)-statistics are in parentheses.
<table>
<thead>
<tr>
<th></th>
<th>Book Leverage</th>
<th>Market Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>5,154</td>
<td>5,154</td>
</tr>
<tr>
<td>Ins.Sell/Trad.Vol. (efwa,t)</td>
<td>-6.41 (2.91)</td>
<td>-7.53 (-3.36)</td>
</tr>
<tr>
<td>M/B (efwa,t-1)</td>
<td>-6.29 (-13.43)</td>
<td>-8.17 (-17.14)</td>
</tr>
<tr>
<td>Dum_1 ( M/B) (efwa,t-1)</td>
<td>-0.97 (-2.67)</td>
<td>-1.00 (-2.70)</td>
</tr>
<tr>
<td>Ins.Sell/Trad.Vol. (t)</td>
<td>-8.28 (-4.50)</td>
<td>-19.85 (-10.59)</td>
</tr>
<tr>
<td>M/B (t-1)</td>
<td>1.78 (3.95)</td>
<td>-3.18 (-6.94)</td>
</tr>
<tr>
<td>PPE/A (t-1) %</td>
<td>0.03 (2.73)</td>
<td>0.06 (5.88)</td>
</tr>
<tr>
<td>EBITDA/A (t-1) %</td>
<td>-0.54 (-14.06)</td>
<td>-0.71 (-18.17)</td>
</tr>
<tr>
<td>Log(S) (t-1)</td>
<td>3.40 (26.33)</td>
<td>1.64 (12.46)</td>
</tr>
<tr>
<td>(R^2)</td>
<td>0.25</td>
<td>0.44</td>
</tr>
</tbody>
</table>
Table 26
Leverage, Subsequent Performance, and Adverse Component of the Spread: Model II

OLS regressions of book and market leverage on the ratio of net insider selling over trading volume, market-to-book ratio, fixed assets, profitability, and firm size.

\[
\left( \frac{D}{A} \right)_t = \alpha + \beta_1 \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_{\text{efwa},t} + \beta_2 \left( \frac{M}{B} \right)_{\text{efwa},t-1} + \beta_3 \text{Dum}_{t} \left( \frac{M}{B} \right)_{\text{efwa},t-1} + \beta_4 \left( \frac{\text{Net.Ins.Sell}}{\text{Trad.Vol.}} \right)_{t} + \beta_5 \left( \frac{M}{B} \right)_{t-1} + \beta_6 \left( \frac{\text{PPE}}{A} \right)_{t-1} + \beta_7 \left( \frac{\text{EBITDA}}{A} \right)_{t-1} + \beta_8 \ln(S)_{t-1} + \epsilon_t,
\]

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10 or the absolute value of net insider selling over trading volume is above 0.5. Net insider trading over trading volume and market-to-book are defined in two ways. The first is a weighted average net insider selling over trading volume, and market-to-book, from year 1987 to year \( t \) for net insider selling and to \( t-1 \) for market-to-book. The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. The second is the net insider selling over trading volume and market-to-book ratio, respectively, in year \( t-1 \) and year \( t \). Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. Dummy variable equals one for companies in the upper quartile, based on the ranking by 1 minus the weighted average adverse selection component of the bid-ask spread; Model II (\( 1-R^2 \)), zero otherwise. \( t \)-statistics are in parentheses.
<table>
<thead>
<tr>
<th></th>
<th>Book Leverage</th>
<th>Market Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>5,154</td>
<td>5,154</td>
</tr>
<tr>
<td></td>
<td>(-2.90)</td>
<td>(-3.40)</td>
</tr>
<tr>
<td>M/B_{efwa,t-1}</td>
<td>-6.40</td>
<td>-8.53</td>
</tr>
<tr>
<td></td>
<td>(-13.41)</td>
<td>(-17.57)</td>
</tr>
<tr>
<td>Dum_{1} (M/B)_{efwa,t-1}</td>
<td>-0.19</td>
<td>0.69</td>
</tr>
<tr>
<td></td>
<td>(-0.51)</td>
<td>(1.77)</td>
</tr>
<tr>
<td></td>
<td>(-4.56)</td>
<td>(-10.63)</td>
</tr>
<tr>
<td>M/B_{t-1}</td>
<td>1.80</td>
<td>-3.05</td>
</tr>
<tr>
<td></td>
<td>(3.98)</td>
<td>(-6.64)</td>
</tr>
<tr>
<td>PPE/A_{t-1} %</td>
<td>0.03</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>(2.76)</td>
<td>(5.90)</td>
</tr>
<tr>
<td>EBITDA/A_{t-1} %</td>
<td>-0.54</td>
<td>-0.71</td>
</tr>
<tr>
<td></td>
<td>(-14.09)</td>
<td>(-18.24)</td>
</tr>
<tr>
<td>Log(S)_{t-1}</td>
<td>3.41</td>
<td>1.69</td>
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<tr>
<td></td>
<td>(26.14)</td>
<td>(12.75)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.25</td>
<td>0.44</td>
</tr>
</tbody>
</table>
Table 27
Leverage and Adverse Selection Component of the Spread: Model I

OLS regressions of book and market leverage on $\lambda$ (adverse selection component of the bid-ask spread: model I), market-to-book ratio, fixed assets, profitability, and firm size.

\[
\begin{align*}
\left( \frac{D}{A} \right)_t &= \alpha + \beta_1 (\lambda)_{\text{efwa},t-1} + \beta_2 \left( \frac{M}{B} \right)_{\text{efwa},t-1} + \beta_3 (\lambda)_{t-1} + \beta_4 \left( \frac{M}{B} \right)_{t-1} + \beta_5 \left( \frac{PPE}{A} \right)_{t-1} \\
&+ \beta_6 \left( \frac{EBITDA}{A} \right)_{t-1} + \beta_7 \ln(S)_{t-1} + \epsilon_t
\end{align*}
\]

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity and is expressed in percentage terms. The adverse selection component of the bid-ask spread ($\lambda$) follows Huang and Stoll (1994) model. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10. $\lambda$ and market-to-book are defined in two ways. The first is a weighted average $\lambda$, and market-to-book, from year 1987 to year $t-1$. The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. The second is $\lambda$, and market-to-book ratio, in year $t-1$. Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. $t$-statistics are in parentheses.

<table>
<thead>
<tr>
<th></th>
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<th>Market Leverage</th>
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</thead>
<tbody>
<tr>
<td>N</td>
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<td>12,390</td>
</tr>
<tr>
<td>$\lambda_{\text{efwa},t-1}$</td>
<td>1.50</td>
<td>0.94</td>
</tr>
<tr>
<td></td>
<td>(1.67)</td>
<td>(1.01)</td>
</tr>
<tr>
<td>$\lambda_{t-1}$</td>
<td>-5.21</td>
<td>-6.71</td>
</tr>
<tr>
<td></td>
<td>(-15.11)</td>
<td>(-18.90)</td>
</tr>
<tr>
<td>$M/B_{t-1}$</td>
<td>-3.60</td>
<td>-3.72</td>
</tr>
<tr>
<td></td>
<td>(-4.60)</td>
<td>(-4.61)</td>
</tr>
<tr>
<td>PPE/A$_{t-1}$%</td>
<td>0.05</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>(7.72)</td>
<td>(11.34)</td>
</tr>
<tr>
<td>$\text{EBITDA/A}_{t-1}$%</td>
<td>-0.45</td>
<td>-0.67</td>
</tr>
<tr>
<td></td>
<td>(-18.86)</td>
<td>(-27.34)</td>
</tr>
<tr>
<td>$\ln(S)_{t-1}$</td>
<td>2.63</td>
<td>0.97</td>
</tr>
<tr>
<td></td>
<td>(29.49)</td>
<td>(10.49)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.16</td>
<td>0.36</td>
</tr>
</tbody>
</table>
Table 28
Leverage and Adverse Selection Component of the Spread: Model II

OLS regressions of book and market leverage on 1-R-square (adverse selection component of the bid-ask spread: model II), market-to-book ratio, fixed assets, profitability, and firm size.

\[
\left( \frac{D}{A} \right)_t = \alpha + \beta_1 \left( 1 - R^2 \right)_{efwa,t-1} + \beta_2 \left( \frac{M}{B} \right)_{efwa,t-1} + \beta_3 \left( 1 - R^2 \right)_{t-1} + \beta_4 \left( \frac{M}{B} \right)_{t-1} + \beta_5 \left( \frac{PPE}{A} \right)_{t-1} \\
+ \beta_6 \left( \frac{EBITDA}{A} \right)_{t-1} + \beta_7 \ln(S)_{t-1} + \epsilon_t
\]

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity and is expressed in percentage terms. The adverse selection component of the bid-ask spread (1-Rsquare) is based on a modified version of Venkatesh and Chiang (1986) model. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10. 1-Rsquare and market-to-book are defined in two ways. The first is a weighted average 1-Rsquare, and market-to-book, from year 1987 to year \( t-1 \). The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. The second is 1-Rsquare, and market-to-book ratio, in year \( t-1 \). Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. \( t \)-statistics are in parentheses.

<table>
<thead>
<tr>
<th></th>
<th>Book Leverage</th>
<th>Market Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>9,705</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9,705</td>
</tr>
<tr>
<td>1-Rsquare ( t-1 )</td>
<td>0.05</td>
<td>-6.89</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(-3.97)</td>
</tr>
<tr>
<td>M/B ( t-1 )</td>
<td>-5.71</td>
<td>-6.95</td>
</tr>
<tr>
<td></td>
<td>(-16.67)</td>
<td>(-19.26)</td>
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<tr>
<td>1-Rsquare ( t-1 )</td>
<td>-5.33</td>
<td>-1.44</td>
</tr>
<tr>
<td></td>
<td>(-3.81)</td>
<td>(-0.98)</td>
</tr>
<tr>
<td>M/B ( t-1 )</td>
<td>0.08</td>
<td>-4.78</td>
</tr>
<tr>
<td></td>
<td>(0.24)</td>
<td>(-13.60)</td>
</tr>
<tr>
<td>PPE/A ( t-1 )%</td>
<td>-0.41</td>
<td>-0.62</td>
</tr>
<tr>
<td></td>
<td>(-16.39)</td>
<td>(-23.35)</td>
</tr>
<tr>
<td>EBITDA/A ( t-1 )%</td>
<td>2.68</td>
<td>1.50</td>
</tr>
<tr>
<td></td>
<td>(20.18)</td>
<td>(10.07)</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.17</td>
<td>0.35</td>
</tr>
</tbody>
</table>
Table 29
Leverage and Adverse Selection Component of the Spread: Model I

OLS regressions of book and market leverage on $\hat{\lambda}$ (adverse selection component of the bid-ask spread: model I), market-to-book ratio, fixed assets, profitability, and firm size.

$$
\left( \frac{D}{A} \right)_t = \alpha + \beta_1 (\hat{\lambda})_{\text{efwa}, t-1} + \beta_2 \text{Dum}_t (\hat{\lambda})_{\text{efwa}, t-1} + \beta_3 \left( \frac{M}{B} \right)_{\text{efwa}, t-1} + \beta_4 \left( \frac{M}{B} \right)_{t-1} + \beta_5 \left( \frac{PPE}{A} \right)_{t-1} + \beta_7 \left( \frac{EBITDA}{A} \right)_{t-1} + \beta_8 \ln(S)_{t-1} + \epsilon_t
$$

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity and is expressed in percentage terms. The adverse selection component of the bid-ask spread ($\hat{\lambda}$) follows Huang and Stoll (1994) model. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10. $\hat{\lambda}$ and market-to-book are defined in two ways. The first is a weighted average $\hat{\lambda}$, and market-to-book, from year 1987 to year $t-1$. The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. The second is $\hat{\lambda}$, and market-to-book ratio, in year $t-1$. Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. Dummy variable equals one for the lower quartile (smaller companies), zero otherwise. $t$-statistics are in parentheses.

<table>
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<tr>
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<th>Book Leverage</th>
<th>Market Leverage</th>
</tr>
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<tbody>
<tr>
<td>$\hat{\lambda}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>efwa, t-1</td>
<td>-0.08</td>
<td>-1.07</td>
</tr>
<tr>
<td></td>
<td>(-0.09)</td>
<td>(-1.15)</td>
</tr>
<tr>
<td>M/B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>efwa, t-1</td>
<td>-5.02</td>
<td>-6.47</td>
</tr>
<tr>
<td></td>
<td>(-14.61)</td>
<td>(-18.34)</td>
</tr>
<tr>
<td>$\hat{\lambda}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t-1$</td>
<td>-3.20</td>
<td>-3.22</td>
</tr>
<tr>
<td></td>
<td>(-4.11)</td>
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<tr>
<td>M/B</td>
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<tr>
<td>$t-1$</td>
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<tr>
<td></td>
<td>(2.52)</td>
<td>(-16.64)</td>
</tr>
<tr>
<td>PPE/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t-1$ %</td>
<td>0.06</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>(8.14)</td>
<td>(11.89)</td>
</tr>
<tr>
<td>EBITDA/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t-1$ %</td>
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<td>-0.66</td>
</tr>
<tr>
<td></td>
<td>(-18.38)</td>
<td>(-26.84)</td>
</tr>
<tr>
<td>Log(S)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t-1$</td>
<td>2.83</td>
<td>1.22</td>
</tr>
<tr>
<td></td>
<td>(31.26)</td>
<td>(13.06)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.17</td>
<td>0.37</td>
</tr>
</tbody>
</table>
Table 30
Leverage and Adverse Selection Component of the Spread: Model II

OLS regressions of book and market leverage on 1-R-square (adverse selection component of the bid-ask spread: model II), market-to-book ratio, fixed assets, profitability, and firm size.

\[
\left( \frac{D}{A} \right)_t = \alpha + \beta_1 (1 - R^2)_{efwa,t-1} + \beta_2 Dum_t (1 - R^2)_{efwa,t-1} + \beta_3 \left( \frac{M}{B} \right)_{efwa,t-1} + \beta_4 (1 - R^2)_{t-1} + \beta_5 \left( \frac{M}{B} \right)_{t-1} + \beta_6 \left( \frac{PPE}{A} \right)_{t-1} + \beta_7 \left( \frac{EBITDA}{A} \right)_{t-1} + \beta_8 \ln(S)_{t-1} + \epsilon_t
\]

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity and is expressed in percentage terms. The adverse selection component of the bid-ask spread (1-R-square) is based on a modified version of Venkatesh and Chiang (1986) model. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10. 1-Rsquare and market-to-book are defined in two ways. The first is a weighted average 1-Rsquare, and market-to-book, from year 1987 to year t-1. The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. The second is 1-Rsquare, and market-to-book ratio, in year t-1. Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. Dummy variable equals one for the lower quartile (smaller companies), zero otherwise. t-statistics are in parentheses.

<table>
<thead>
<tr>
<th></th>
<th>Book Leverage</th>
<th>Market Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>9,705</td>
<td>9,705</td>
</tr>
<tr>
<td>1-Rsquare</td>
<td>-1.49</td>
<td>-8.85</td>
</tr>
<tr>
<td></td>
<td>(-0.91)</td>
<td>(-5.17)</td>
</tr>
<tr>
<td>Dum _t (1-Rsquare)</td>
<td>10.71</td>
<td>13.60</td>
</tr>
<tr>
<td></td>
<td>(14.75)</td>
<td>(17.86)</td>
</tr>
<tr>
<td>M/B</td>
<td>-5.22</td>
<td>-6.33</td>
</tr>
<tr>
<td></td>
<td>(-15.35)</td>
<td>(-17.75)</td>
</tr>
<tr>
<td>M/B_t-1</td>
<td>-4.49</td>
<td>-0.37</td>
</tr>
<tr>
<td></td>
<td>(-3.25)</td>
<td>(-0.26)</td>
</tr>
<tr>
<td>PPE/A _t-1 %</td>
<td>0.21</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>(0.63)</td>
<td>(13.35)</td>
</tr>
<tr>
<td>EBITDA/A _t-1 %</td>
<td>-0.39</td>
<td>-0.59</td>
</tr>
<tr>
<td></td>
<td>(-15.47)</td>
<td>(-22.38)</td>
</tr>
<tr>
<td>Log(S)_t-1</td>
<td>3.19</td>
<td>2.15</td>
</tr>
<tr>
<td></td>
<td>(23.52)</td>
<td>(15.11)</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.19</td>
<td>0.37</td>
</tr>
</tbody>
</table>
APPENDIX

Table 31
Determinants of Leverage I

OLS regressions of book and market leverage on the market-to-book ratio, fixed assets, profitability, and firm size.

\[
\left( \frac{D}{A} \right)_t = \alpha + \beta_1 \left( \frac{M}{B} \right)_{efwa,t-1} + \beta_2 \left( \frac{M}{B} \right)_{t-1} + \beta_3 \left( \frac{PPE}{A} \right)_{t-1} + \beta_4 \left( \frac{EBITDA}{A} \right)_{t-1} + \beta_5 \ln(S)_{t-1} + \epsilon_i
\]

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity and is expressed in percentage terms. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10. Market-to-book is defined in two ways. The first is a weighted average market-to-book from the first appearance on COMUSTAT to year \(t-1\). The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. The second is the market-to-book ratio in year \(t-1\). Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. We exclude firm year outliers. The book change in leverage is in Panel A. The market change in leverage is in Panel B. \(t\)-statistics are in parentheses.

<table>
<thead>
<tr>
<th>N</th>
<th>M/B (_{efwa,t-1})</th>
<th>M/B (_{t-1})</th>
<th>PPE/A (_{t-1}) %</th>
<th>EBITDA/A (_{t-1}) %</th>
<th>Log(S) (_{t-1})</th>
<th>(R^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>64,999</td>
<td>-5.53</td>
<td>2.00</td>
<td>0.10</td>
<td>-0.68</td>
<td>1.76</td>
<td>0.19</td>
</tr>
</tbody>
</table>

Panel A: Change in Book Leverage %

<table>
<thead>
<tr>
<th>N</th>
<th>M/B (_{efwa,t-1})</th>
<th>M/B (_{t-1})</th>
<th>PPE/A (_{t-1}) %</th>
<th>EBITDA/A (_{t-1}) %</th>
<th>Log(S) (_{t-1})</th>
<th>(R^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>64,999</td>
<td>-6.12</td>
<td>-7.93</td>
<td>0.10</td>
<td>-0.85</td>
<td>0.50</td>
<td>0.41</td>
</tr>
</tbody>
</table>

Panel B: Change in Market Leverage %
Table 32
Determinants of Leverage II

OLS regressions of book and market leverage on the market-to-book ratio, fixed assets, profitability, and firm size.

\[
\left( \frac{D}{A} \right)_{t} = \alpha + \beta_1 \left( \frac{M}{B} \right)_{\text{efwa},t-1} + \beta_2 \left( \frac{M}{B} \right)_{t-1} + \beta_3 \left( \frac{PPE}{A} \right)_{t-1} + \beta_4 \left( \frac{EBITDA}{A} \right)_{t-1} + \beta_5 \ln(S)_{t-1} + \epsilon_i
\]

Book value leverage is book debt to total assets and is expressed in percentage terms. Market leverage is book debt to the result of total assets minus book equity plus market equity and is expressed in percentage terms. The market-to-book ratio is assets minus book equity plus market equity all divided by assets. We drop firm year observations where market-to-book is above 10. Market-to-book is defined in two ways. The first is a weighted average market-to-book from year 1987 to year \(t-1\). The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. The second is the market-to-book ratio in year \(t-1\). Fixed assets intensity is defined as net property, plant and equipment divided by assets. Profitability is defined as operating income before depreciation, divided by assets. Firm size is defined as the log of net sales. We exclude firm year outliers. The book change in leverage is in Panel A. The market change in leverage is in Panel B. \(t\)-statistics are in parentheses.

<table>
<thead>
<tr>
<th>(N)</th>
<th>(\text{M/B}_{\text{efwa},t-1})</th>
<th>(\text{M/B}_{t-1})</th>
<th>(\text{PPE/A}_{t-1}) %</th>
<th>(\text{EBITDA/A}_{t-1}) %</th>
<th>(\log(S)_{t-1})</th>
<th>(R^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\beta_1)</td>
<td>(t(\beta_1))</td>
<td>(\beta_2)</td>
<td>(t(\beta_2))</td>
<td>(\beta_3)</td>
<td>(t(\beta_3))</td>
<td>(\beta_4)</td>
</tr>
<tr>
<td>27,837</td>
<td>-5.77</td>
<td>(-25.95)</td>
<td>0.53</td>
<td>(2.49)</td>
<td>0.03</td>
<td>(5.94)</td>
</tr>
</tbody>
</table>

Panel A: Change in Book Leverage %

<table>
<thead>
<tr>
<th>(N)</th>
<th>(\text{M/B}_{t-1})</th>
<th>(\text{PPE/A}_{t-1}) %</th>
<th>(\text{EBITDA/A}_{t-1}) %</th>
<th>(\log(S)_{t-1})</th>
<th>(R^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\beta_1)</td>
<td>(t(\beta_1))</td>
<td>(\beta_2)</td>
<td>(t(\beta_2))</td>
<td>(\beta_3)</td>
<td>(t(\beta_3))</td>
</tr>
<tr>
<td>27,837</td>
<td>-7.47</td>
<td>(-32.28)</td>
<td>-5.45</td>
<td>(-24.80)</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Panel B: Change in Market Leverage %
REFERENCES


