“Tradeoff and Pecking Order Theories of Debt”

Murray Z. Frank and Vidhan K. Goyal

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Abstract

Taxes, bankruptcy costs, transactions costs, adverse selection, and agency conflicts have all been advocated as major explanations for the corporate use of debt financing. These ideas have often been synthesized into the trade-off theory and the pecking order theory of leverage. These theories and the related evidence is reviewed. A number of important empirical stylized facts are identified. To understand the evidence, it is important to recognize the differences among private firms, small public firms and large public firms. Private firms seem to use retained earnings and bank debt heavily. Small public firms make active use of equity financing. Large public firms primarily use retained earnings and corporate bonds. The available evidence can be interpreted in several possible ways. Direct transaction costs and indirect bankruptcy costs appear to play important roles in a firm’s choice of debt. The relative importance of the other factors remains open to debate. No currently available model appears capable of simultaneously accounting for the stylized facts.

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1 Introduction

How do firms finance their operations? How should firms finance their operations? What factors influence these choices? How do these choices affect the rest of the economy? These are important questions of long standing. At one time, the complexity of the problem was thought by many to be so great as to defy the development of reasonable theories. Half a century ago Weston (1955) even felt the need to argue that it was possible to develop reasonable theories about these matters. Since then, a remarkably large number of ideas and theories have been proposed to answer these questions.

In a particularly influential treatment of the problem, Myers (1984) considers a contest between two perspectives on corporate debt. He calls the hypothesis that firms balance tax savings from debt against deadweight bankruptcy costs the trade-off theory. He calls the hypothesis that, due to adverse selection, firms first look to retained earnings, then to debt, and only in extreme circumstances to equity for financing the pecking order theory. In this review, we consider the literature and evidence that has developed out of Myers’s contest.

According to Myers (1984) there are at least two key implications of these theories. The key implication of the trade-off theory is that leverage exhibits target adjustment so that deviations from the target are gradually eliminated. The key prediction of the pecking order theory is the strict ordering of financing. Myers presents these two theories as broad organizing frameworks that can potentially help account for many facts. But it is also possible to view both theories as part of a much broader set of factors that

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3“Many teachers of business finance are skeptical about the existence or possibility of theories of financial policy. To support their position, they emphasize both the wide range of influences on financial decisions and their varying importance from one situation to another. The subjectivity of many factors makes them dependent on the psychological makeup of the decision-maker. Furthermore, it is well known that in the analysis of business cases, two or more solutions usually appear equally defensible. Those who hold to the skeptical position therefore assert that there can be no science of business finance since experts cannot arrive at unique answers” (Weston, 1955).
determine the capital structure of a firm. Many scholars seem inclined to view both theories in this more limited way.

The claim that leverage exhibits target adjustment is in fact neither necessary nor sufficient for the firm to be balancing tax savings against bankruptcy costs. Accordingly, target adjustment is better viewed as being a separate hypothesis. We use the term “static trade-off theory” for the hypothesis that bankruptcy and taxes are the key factors that determine leverage within a static model.

Drawing a distinction between the static trade-off theory and the target adjustment hypothesis is important for both theoretical and empirical reasons. Target adjustment can be implied by a variety of dynamic theories. These theories may reflect taxes and bankruptcy costs, but they may also have other causes. Static models do not make predictions about dynamics without some auxiliary assumptions. The target adjustment hypothesis receives much clearer empirical support than does either the static trade-off theory or the pecking order theory.

The empirical literature supports a number of generalizations that appear to be robust and particularly important for an understanding of actual leverage. In order to draw attention to these key facts, we have highlighted these generalizations using the label “stylized fact.” For ease of reference, these stylized facts are also collected at the end in an appendix.

Ideally it would be nice to have a model that incorporated all of the stylized facts. Not only is such a unifying model not currently available but, even worse, the standard versions of the available models actually contradict some of the known facts. Different models have problems with different facts.\footnote{Myers (2003) argues that a satisfactory unifying model is unlikely to become available in the foreseeable future. We are somewhat more hopeful.}

A particularly important problem for the standard static trade-off theory is provided by the historical record. In the static trade-off theory it is the desire to limit tax payments that motivates a firm to use debt financing (see Modigliani and Miller, 1963 for an extreme version). As discussed in section \[3.1\] it is actually quite difficult to match the observed leverage ratios in particular decades with the corporate tax rates in those decades. Even more remarkable, corporate income taxes are only about a century old. Debt financing was common long before the introduction of the corporate
Thus, we know that taxes do not provide a complete justification for the use of debt financing. This does not, of course, imply that taxes can be safely ignored when analyzing modern corporate use of debt.

A particularly important problem for the standard version of the pecking order theory concerns the use of equity financing. Firms issue too much equity (Frank and Goyal, 2003) and at the wrong times (Fama and French 2004, and Leary and Roberts, 2004a). In the pecking order, it is the financing deficit that drives debt issues. Empirically, however, other factors appear more important (Frank and Goyal, 2003).

Thus the standard versions of both the trade-off theory and the pecking order theory appear to be inadequate. Both approaches need to be improved to account for the known facts.

Proponents of the trade-off approach are focusing their efforts mainly on developing dynamic structural trade-off models. An attractive feature of these models is that they try to provide a unified framework that can simultaneously account for many facts. Examples include Leary and Roberts (2004b), Hennessy and Whited (2004), Strebulaev (2004), and Ju et al. (2004).

Proponents of the pecking order theory are focusing their efforts on the development of a satisfactory notion of ‘debt capacity’ (see, for example, Lemmon and Zender (2004)) and, on more complex adverse selection models (see, for example, Halov and Heider (2004)).

As a substantive matter, there is clear evidence that bankruptcy costs and direct transactions cost play at least some role and that leverage is stationary over the long run. There is room for reasonable differences of opinion regarding the relative importance of many factors including taxation, adverse selection, and various agency conflicts.

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5 For example: “[in 1731] the French consul in Genoa wrote: ‘Lack of confidence keeps money in short supply; so those who usually do business on credit, which means most of the merchants in the city, are doing very little. The best purses are shut.’” (Braudel 1982 pages 397-398).
2 Theory

2.1 Kinds Of Theories

Disagreements over the merits of financial theories stem, in part, from different views of the role that theory plays. It is, therefore, helpful to recognize the different kinds of theory.

One kind of theory represents a point of view. A point of view theory is not an explicit model, but rather a set of principles that guide the development of specific models and tests. Both the pecking order and the trade-off theories can be understood as point of view theories. Each provides a guide for the development of models and tests. But neither is tied to a specific model formulation.

A second kind of theory is an illustrative theory. An illustrative theory shows how a certain idea can be expressed in a coherent manner. The point of an illustrative theory is to show an idea in as clear and as simple a manner as possible. Accordingly strong assumptions are often made to solve specific models in closed form.

A third kind of theory is a unifying model. A unifying model is presented as a means of tying together a variety of observations in a coherent manner. A unifying model is supposed to integrate many facts to show that they stem from a common underlying structure. Often, but not always, such models do not have closed-form solutions and so numerical calibrations are used to solve them.

A fourth kind of theory is normative theory. Normative theory is intended to offer advice to someone. At this stage of development, very little of the theory in finance is intended as advice to CFOs. However studies such as Graham (2000), in which he argues that many firms could increase value by levering up, seem very interesting from a normative perspective. It is likely that, in the next few years, this kind of analysis will become much more common in corporate finance.

Both the pecking order and the trade-off theories provide points of view. Both have been illustrated in specific models with particular simplifying assumptions. Both are often presented as unifying theories.

Moving from a point of view to a specific model requires making assumptions. When the pecking order and the trade-off theories are formulated as specific models, they are easy to reject on a variety of dimensions. But not all rejections of a model are
equally serious. The model may still provide a very useful way to think about the data. Even if a model is rejected, it may still fit the evidence better than any other available model. How to balance formal rejection versus insight is not easy. What should and what should not count as evidence against a particular point of view? There is room for reasonable people to answer this question in differing ways.

Advocates of the trade-off point of view tend to take rational optimizing behavior particularly seriously. Advocates of the pecking order point of view tend to take the dominance of retained earnings and debt over equity particularly seriously. These are not inherently conflicting considerations, however.

### 2.2 Modigliani-Miller Theorem

The theory of business finance in a modern sense starts with the Modigliani and Miller (1958) capital structure irrelevance proposition. Before Modigliani and Miller, there was no generally accepted theory of capital structure. They start by assuming that the firm has a particular set of expected cash flows. When the firm chooses a certain proportion of debt and equity to finance its assets, all that it does is to divide up the cash flows among investors. Investors and firms are assumed to have equal access to financial markets, which allows for homemade leverage. The investor can create any leverage that was wanted but not offered, or the investor can get rid of any leverage that the firm took on but was not wanted. As a result the leverage of the firm has no effect on the market value of the firm.

Their paper led subsequently to both clarity and controversy. As a matter of theory, capital structure irrelevance can be proved under a range of circumstances. There are two fundamentally different types of capital structure irrelevance propositions. The classic arbitrage-based irrelevance propositions provide settings in which arbitrage by investors keeps the value of the firm independent of its leverage. In addition to the original Modigliani and Miller paper, important contributions include papers by Hirshleifer (1966) and Stiglitz (1969).

A second kind of capital structure irrelevance is associated with multiple equilibria.

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6 As is common with important contributions to knowledge, there is some dispute on the origin of the idea. Williams (1938) has a relatively clear statement of the idea, but did not present an explicit arbitrage-based proof. Rubinstein (2003) presents an interesting discussion of the history of ideas.
In models of this kind, equilibrium conditions pin down the aggregate amount of debt and equity in the market. But the model does not specify how these aggregate quantities get divided up among the firms. The classic paper is by Miller (1977) in which consideration of both personal and corporate tax determines an economy-wide leverage ratio, but there are multiple equilibria in which debt is issued by different firms. A similar kind of firm-level capital structure irrelevance is found in Auerbach and King’s (1983) paper.

The 1958 paper also stimulated serious research devoted to disproving irrelevance as a matter of theory or as an empirical matter. This research has shown that the Modigliani-Miller theorem fails under a variety of circumstances. The most commonly used elements include consideration of taxes, transaction costs, bankruptcy costs, agency conflicts, adverse selection, lack of separability between financing and operations, time varying financial market opportunities, and investor clientele effects. Alternative models use differing elements from this list. Given that so many different ingredients are available, it is not surprising that many different theories have been proposed. Covering all of these would go well beyond the scope of this paper. Harris and Raviv (1991) provided a classic survey of the theory development as of the time it was written.

As an empirical proposition, the Modigliani-Miller irrelevance proposition is not easy to test. With debt and firm value both plausibly endogenous and driven by other factors such as profits, collateral, growth opportunities, etc., we cannot get a structural test of the theory by regressing value on debt. However, the fact that there are fairly reliable empirical relations between a number of factors and corporate leverage, while not disproving the theory, does make it seem an unlikely characterization of how real businesses are financed.

What then to make of the theorem? A popular defense has been to argue as follows. “While the Modigliani-Miller theorem does not provide a realistic description of how firms finance their operations, it provides a means of finding reasons why financing may matter.” This description provides a reasonable interpretation of much of the theory of corporate finance up to perhaps the 1980s. Accordingly, it influenced the early development of both the trade-off theory and the pecking order theory. However, 

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7Fama and French (1998) and Kemsley and Nissim (2002) provide related discussions.
as sections 2.3 and 2.4 show, current progress in capital structure theory is not based on reexamining the list of assumptions that generate the Modigliani-Miller theorem to find a previously unrelaxed assumption.

2.3 Trade-off

The term trade-off theory is used by different authors to describe a family of related theories. In all of these theories, a decision maker running a firm evaluates the various costs and benefits of alternative leverage plans. Often it is assumed that an interior solution is obtained so that marginal costs and marginal benefits are balanced.

The original version of the trade-off theory grew out of the debate over the Modigliani-Miller theorem. When corporate income tax was added to the original irrelevance proposition (see Modigliani and Miller, 1963) this created a benefit for debt in that it served to shield earnings from taxes. Since the firm’s objective function is linear, and there is no offsetting cost of debt, this implied 100% debt financing.

To avoid this extreme prediction, an offsetting cost of debt is needed. The obvious candidate is bankruptcy. Kraus and Litzenberger (1973) provide a classic statement of the theory that optimal leverage reflects a trade-off between the tax benefits of debt and the deadweight costs of bankruptcy. According to Myers (1984), a firm that follows the trade-off theory sets a target debt-to-value ratio and then gradually moves towards the target. The target is determined by balancing debt tax shields against costs of bankruptcy.

Several aspects of Myers’ definition merit discussion. First, the target is not directly observable. It may be imputed from evidence, but that depends on adding a structure. Different papers add that structure in different ways.

Second, the tax code is much more complex than that assumed by the theory. Depending on which features of the tax code are included, different conclusions regarding the target can be reached. Graham (2003) provides a useful review of the literature on tax effects.

Third, bankruptcy costs must be deadweight costs rather than transfers from one claimant to another. The nature of these costs is important too. Are these fixed costs? Do they increase with the size of the bankruptcy? Are the costs one-time costs like a lawyer’s fees or are they permanent costs like the cost of a damaged reputation?
Haugen and Senbet (1978) provide a useful discussion of bankruptcy costs.

Fourth, transactions costs must take a specific form for the analysis to work. For the adjustment to be gradual rather than abrupt, the marginal cost of adjusting must increase when the adjustment is larger. This assumed form of adjustment cost is rather surprising since one expects to see large fixed costs and perhaps roughly constant marginal costs. This implies a very different adjustment path. Leary and Roberts (2004b) describe the implications of alternative adjustment cost assumptions.

For these reasons, we break Myers’s definition into two parts. The first part we call the static trade-off theory. The second part we call target adjustment behavior.

**Definition 1** A firm is said to follow the static trade-off theory if the firm’s leverage is determined by a single period trade-off between the tax benefits of debt and the deadweight costs of bankruptcy.

**Definition 2** A firm is said to exhibit target adjustment behavior if the firm has a target level of leverage and if deviations from that target are gradually removed over time.

### 2.3.1 Static Trade-off

The standard presentation of the static trade-off theory is provided by Bradley et al. (1984). The assumed tax structure is not intended to be strictly realistic. For instance, the tax code contains important dynamic aspects that cannot be properly represented in a single-period model. However, the model does contain some important elements of the actual U.S. tax code.

Investors are risk-neutral and face a progressive tax rate on end-of-period wealth from bonds. Dividends and capital gains are taxed at a single constant rate. Risk-neutrality induces the investor to invest into whichever security offers the better expected after-tax deal.

The firm faces a constant marginal tax rate on end-of-period wealth. The firm can deduct both interest and principle payments, but the investor must pay taxes as these payments are received. Non-debt tax shields exist but they cannot be arbitraged across firms or across states of nature. If the firm is unable to make the promised debt payment, then it incurs deadweight financial distress costs, so “the pie shrinks.”
Let $\tau_c$ = the constant marginal tax rate on corporate income, $\tau_{pb}$ = the progressive tax rate on investor bond income, $\tau_{pe}$ = the tax rate on investor equity income, $X$ = the end-of-period value of the firm before taxes and debt payments, $k$ = the fraction of end-of-period value that is lost if the firm defaults on debt, $B$ = the end-of-period payment promised to bondholders, $\phi$ = the total after-tax value of non-debt tax shields if fully used, $r_f$ = the risk-free, tax-free rate of return, $f(X)$ is the probability density of $X$, and $F(\cdot)$ = the cumulative probability density function.

The following table describes the returns to stockholders and bondholders in various states defined by the level of corporate earnings. The column ‘total’ indicates the firm’s total earnings, denoted as $X$. If the earnings are negative, then both debt and equity give up their claims; no debt is paid. If the earnings are positive but not enough to cover the promised debt payment, $B$, then equity defaults, and debt takes over. There is a deadweight loss of $kX$ that is used up in the process.

<table>
<thead>
<tr>
<th>Total</th>
<th>State</th>
<th>Debt</th>
<th>Equity</th>
<th>Tax</th>
<th>Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>$X$</td>
<td>$X &lt; 0$</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>$X$</td>
<td>$0 &lt; X &lt; B$</td>
<td>$X(1-k)$</td>
<td>0</td>
<td>0</td>
<td>$kX$</td>
</tr>
<tr>
<td>$X$</td>
<td>$B &lt; X &lt; B + \phi/\tau_c$</td>
<td>$B$</td>
<td>$X - B$</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>$X$</td>
<td>$X &gt; B + \phi/\tau_c$</td>
<td>$B$</td>
<td>$X - B - \tau_c(X - B) + \phi$</td>
<td>$\tau_c(X - B) - \phi$</td>
<td>0</td>
</tr>
</tbody>
</table>

If earnings are large enough for equity not to default, then there remains the question of whether the earnings are low enough that the non-debt tax shield is sufficient to cover the tax liability. Thus, the last two ranges of states differ with respect to taxation. In the last range of states (high income) the firm is able to utilize fully the non-debt tax shield ($\phi$) and so equityholders receive $X - B - \tau_c(X - B) + \phi$. In the penultimate range of states, income is not sufficiently high and non-debt tax shields are not fully utilized. As a result no tax is paid and equityholders receive $X - B$. The dividing line occurs as the point where income is just sufficient to have $X - B = X - B - \tau_c(X - B) + \phi$. Obviously, this can be rearranged to $X = B + \phi/\tau_c$, which defines the boundary as shown above.

The market value of debt is found by integrating the bondholder after-tax returns across various states of nature:

$$V_B = \left(1 - \tau_{pb}\right) \left[ \int_B^\infty B f(X) dX + \int_0^B X(1-k) f(X) dX \right]. \quad (1)$$
The market value of equity can be obtained by integrating the stockholder after-tax returns across different states of nature:

$$V_S = (\frac{1 - \tau_{ps}}{1 + r_f}) \left[ \int_{B + \phi / \tau_c}^{\infty} [(X - B)(1 - \tau_c) + \phi] f(X) dX + \int_B^{B + \phi / \tau_c} (X - B) f(X) dX \right].$$  (2)

Adding together $V_S$ and $V_B$ gives an expression for the value of the firm, i.e. $V = V_S + V_B$. It is assumed that the firm’s choice of leverage, $B$, is determined by maximizing $V$.

The assumption that $B$ is chosen to maximize $V$ is conventional, but it is not innocuous. For instance the firm might be maximizing managerial welfare, or the welfare of a particular set of large shareholders who have control. Such agency conflicts are assumed away. As usual, in an optimization problem, the optimal value might be found at either an interior point or on a boundary. If the optimal solution is interior, then it is provided by a first- order condition determined by differentiating $V$ with respect to $B$ and setting it equal to zero, i.e., $\partial V / \partial B = 0$. For this model we have,

$$\partial V / \partial B = \left( \frac{1 - \tau_{ps}}{1 + r_f} \right) \left\{ [1 - F(B)] \left[ 1 - \frac{(1 - \tau_c)(1 - \tau_{ps})}{(1 - \tau_{pb})} \right] - \frac{(1 - \tau_{ps}) \tau_c}{1 - \tau_{pb}} \left[ F(B + \phi / \tau_c) - F(B) \right] - kBF(B) \right\}.$$  (3)

The first term in this expression represents the marginal net tax benefit of debt. The second term represents the increase in the probability of wasting interest tax shields when earnings are less than tax shields. The third term represents the marginal increase in expected costs of distress. The firm’s decision involves trading off the marginal tax advantage of debt against the marginal leverage-related costs. The main predictions from the model are found by redifferentiating the first-order condition with respect to each of the parameters of interest. They show that:

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8 This model nests a number of prior theories as special cases. To get Miller’s (1977) model, set $\tau_{ps} = k = \phi = 0$, so that $\partial V / \partial B = ([1 - F(B)] \tau_c - [1 - F(B)] \tau_{ps}) / (1 + r_f)$. The firm term is the marginal tax advantage of debt obtained by multiplying the corporate tax rate ($\tau_c$) with the probability that the firm will not default ($1 - F(B)$). The second term is the tax premium the firm expects to pay to bondholders. To get DeAngelo and Masulis’s (1980) model set $\tau_{ps} = 0$, and find $\partial V / \partial B = ([1 - F(B)] \tau_c - \tau_{ps}) - \tau_c [F(B + \phi / \tau_c) - F(B)] - (1 - \tau_{ps})kBf(B) / (1 + r_f)$. If either $\phi$ or $k$ is positive, $\tau_c$ will be greater than $\tau_{ps}$ and the first term, which represents the net tax advantage of debt, will be positive.
1. An increase in the costs of financial distress ($k$) reduces the optimal debt level;

2. An increase in non-debt tax shields ($\phi$) reduces the optimal debt level;

3. An increase in the personal tax rate on equity ($\tau_{ps}$) increases the optimal debt level;

4. At the optimal capital structure, an increases in the marginal bondholder tax rate ($\tau_{pb}$) decreases the optimal level of debt;

5. The effect of risk ($\sigma$) is ambiguous, even if uncertainty is assumed to be normally distributed. For “reasonable” parameter values, Bradley et al. (1984) show that the relation between the debt ratio and volatility is negative.

Although most of the predictions are intuitively reasonable, it is surprising that the affect of risk on leverage is ambiguous. This ambiguity between leverage and risk is also found in a variety of other models.

Tests of this model face the problem that the main elements of the model are not directly observable. Instead, proxies are used. This implies that only indirect testing is actually conducted. When, for instance, Bradley et al. (1984) find an unexpected sign on non-debt tax shields, it is unclear whether the problem is a defect in the theory or a defect in the proxy.

This trade-off model is static although firms in the real world operate over many periods. Thus, testing the theory with data requires making auxiliary assumptions. Two aspects of static modelling are particularly important in tests of the theory – the role of retained earnings and the interpretation of mean reversion.

By construction, there are no retained earnings in the model. How should one interpret retained earnings? At one level, it can be argued that retained earnings are direct evidence that a one-period model is inappropriate. While there is some truth to such a claim, it is fairly harsh. Theories are always simplifications. Retained earnings represent inside equity and profitable firms create this kind of equity automatically. Unless the firm takes some offsetting action, the more profitable a firm is, the lower its leverage will be. This kind of equity creation is conceptually rather different from a secondary equity issue.
Again, by construction, as already discussed this theory says nothing about mean reversion. The model has a solution for leverage, but there is no room in the model for the firm ever to be anywhere but at the solution. Thus the model contains no notion of target adjustment. This is why we separated the static trade-off theory from the target adjustment hypothesis. Evidence for or against mean reversion is not evidence of the applicability of the static trade-off theory. These are separate questions. Predictions about dynamics arise from dynamic models.

These two unmodelled aspects of the theory have been very influential in forming the profession’s view of trade-off theory and have resulted in considerable dissatisfaction with the theory. Some scholars have reacted by turning away from taxation and bankruptcy costs as key features altogether (e.g., Jensen and Meckling 1976, Myers 1984), and for many years this alternative line of research dominated corporate finance scholarship. In the last few years, some scholars have been returning to consideration of taxation and bankruptcy costs, but with an explicit treatment of the fact that firms last for more than a single period – “dynamic trade-off theory.”

2.3.2 Dynamic Trade-off

Constructing models that recognize the role of time requires specifying a number of aspects that are typically ignored in a single-period model. Of particular importance are the roles of expectations and adjustment costs. In a dynamic model, the correct financing decision typically depends on the financing margin that the firm anticipates in the next period. Some firms expect to pay out funds in the next period, while others expect to raise funds. If funds are to be raised, they may take the form of debt or equity. More generally, a firm undertakes a combination of these actions. Before discussing individual papers, we present two illustrative examples of the potential importance of dynamics in financing decisions.

First Example. Consider a firm that is very profitable. Instead of raising funds, it plans to distribute money to its shareholders. It can distribute funds today, or it can hold onto the funds for one more period and then distribute them next period. Which should the firm do? The answer depends on the tax rates and on rates of return that the firm can earn relative to the returns that the shareholders can obtain directly. (Evidently, we are far from the world of Modigliani and Miller (1958) at this point.) Since
the firm is quite profitable, suppose that the firm has much better investment opportunities than do the shareholders. Then, it may be better for the firm to hold onto the funds even if it has a higher tax rate than the shareholders have. The more profitable the firm is, presumably the more likely this is true. Thus, the example suggests that more profitable firms should retain more earnings than should less profitable firms. Since retained earnings are equity, in this example we might expect to see the more-profitable firms have lower leverage.

Second Example. Consider a firm that has more money today than it wishes to invest today. Suppose that the firm expects it will need the money in a year or two. In a tax-free world, the firm could pay out the excess money to shareholders today. Later, when funds are needed, the firm could raise new equity. But taxes create a wedge. Paying out money causes shareholders to pay taxes. With taxes, such financing round trips can be expensive. Thus, distributing funds and then raising new equity subsequently imposes a tax liability on shareholders that could have been avoided had the firm retained the funds. Hence, taxes can directly motivate firms to retain earnings.

These two examples are not complete theories. They are merely illustrations of the fact that dynamic trade-off models depart from static trade-off models in interesting ways.

The early attempts to model the dynamic trade-off appeared to be technically hard, and not all that promising at a time when adverse selection and agency considerations were center stage in the literature. Currently scholars are starting to work through the technical problems that are present in dynamic models with uncertainty and bankruptcy. The dynamic models contain features that seem to allow the trade-off theory to provide a much better account of how firms finance their operations than had been thought.

An important precursor to modern dynamic trade-off theories was Stiglitz (1973), which examines the effects of taxation from a public finance perspective. Stiglitz’s model is not a trade-off theory since he took the drastic step of assuming away uncertainty. This, of course, simplifies things immensely. His analysis, which allows for

\footnote{Due to the technical difficulties the current papers all make important simplifying assumptions that are probably with loss of generality. Unfortunately at this time, in contrast to the literature on asset pricing, we do not yet have a common work horse model from which individual papers can naturally be developed.}
both personal and corporate taxes, highlights an interesting asymmetry in the tax code. Money paid in to the firm is not taxed, but money paid out is taxed.\footnote{There is “a basic asymmetry (which arises even in our idealized tax structure) between payments to shareholders and receipts from them. Payments to shareholders are taxed, so reductions in dividends or in shares purchased back from shareholders reduce the taxes paid, but receipts from shareholders are not taxed. Accordingly, if the firm is not paying out any dividends, using all of its retained earnings for investment, and financing the excess of investment over retained earnings by debt, an attempt to increase the equity by reducing the new debt issue and increasing the new equity issue will have disadvantageous tax effects; there will be no reduction in taxation on equity account this period but an increase in corporate profit taxes paid in future periods because of the reduction in interest payments (Stiglitz (1973, page 7))”} For reasonable parameter values, Stiglitz’s basic result is that it pays to finance as much investment as possible through retained earnings and the excess of investment over retained earnings with debt. The observed leverage ratio is thus a ‘fortuitous outcome of the profit and investment history of the firm’ (Stiglitz, 1973, page 32). In other words the solution is essentially what we might now call the pecking order.

The first dynamic models to consider the tax savings versus bankruptcy cost trade-off are Kane et al. (1984) and Brennan and Schwartz (1984). Both analyzed continuous time models with uncertainty, taxes, and bankruptcy costs, but no transaction costs. Since firms react to adverse shocks immediately by rebalancing costlessly, firms maintain high levels of debt to take advantage of the tax savings. These models reinforced Miller’s (1977) idea that the trade-off theory predicts much higher debt levels than those typically observed at most firms (see section 3.2.3).

To avoid the unrealistically rapid rebalancing problem, Fischer et al. (1989) introduced transaction costs into the analysis of dynamic capital structures. Because of transaction costs, the firm allows its capital structure to drift much of the time. When its leverage gets too far out of line, the firm undertakes a discrete rebalancing. They assumed that the rebalancing takes place at an upper and at a lower limit so that recapitalization takes the form of an “$(s, S)$” policy. When the firm earns profits, it pays down debt. If the lower leverage limit is reached, the firm recapitalizes. If the firm loses money so that debt increases, it will again permit the drift until the boundary is reached. Accordingly, when we look at a large panel of data, most of the data reflects drift rather than active rebalancing. This can account for the empirical observation that profits and leverage are negatively related.

Fischer et al. (1989) solve the model numerically. Their simulations suggest that
even small transaction costs can lead to delay in rebalancing and wide variations in the debt ratio. The numerical solutions have a number of reasonable features. The tax advantage of debt is increasing in the corporate tax rate and decreasing in the personal tax rate. Greater volatility is associated with an increased range over which the firm permits leverage to fluctuate, and to a reduction in the target to which the firm re-capitalizes when boundaries are reached. Thus volatility is negatively associated with average leverage. Leary and Roberts (2004b) show that the Fischer et al. model is capable of accounting for a number of aspects of firm leverage dynamics. More controversially, in the Fischer et al. model, good operating performance will eventually cause the firm to hit the refinancing barrier at which point it loads up on debt. Thus good performance is eventually followed by debt issues.

In order to understand the recent dynamic trade-off literature it is helpful to classify the papers according to the assumptions embedded in the papers. One important dividing line is the treatment of investment. Classical analysis such as Modigliani and Miller (1958) and Kraus and Litzenberger (1973) takes the firm’s cash flows as exogenous. Many trade-off models such as Kane et al (1984), Fischer et al (1989), Goldstein et al (2001) and Strebulaev (2004) follow this tradition of keeping the firm’s cash flows as exogenous. However, it is quite likely that investment and thus the firm’s cash flows will depend on how the firm finances its operations. Thus some papers consider investment along with financing. Notably this is done by Brennan and Schwartz (1984), Mello and Parsons (1992), Mauer and Triantis (1994), Hennessy and Whited (2004), and Titman and Tsyplakov (2004).

If the firm’s earnings are stochastic but unrelated to leverage then one must decide how to model the excess cash in good times. Generally it is assumed to be paid out to the shareholders. Many papers do not give the firm a choice of how much to pay out versus how much to retain. For example, Brennan and Schwartz (1984) and Titman and Tsyplakov (2004) assume that the firm pays out all funds. This assumption obviously limits the ability of the theory to speak to the empirically important issue of retained earnings. Both Stiglitz (1973) and Hennessy and Whited (2004) are more satisfactory in

\[1\] Some have objected that persistently profitable firms do not often go out to load up on debt. However, such firms do undertake significant new debt when engaging in mergers and acquisitions. Profitable firms do seem more likely to undertake such actions. How best to think about the relation between leverage and M&A activity probably deserves more attention.
this respect.

The tax system assumptions differ across papers. Kane et al. (1984), Fischer et al. (1989) and Titman and Tsyplakov (2004) omit consideration of taxes on corporate payouts. To have linear tax on distributions, Goldstein et al. (2001) and Strebulaev (2004) appear to be effectively assuming that the shareholders get a tax rebate when contributing equity. By contrast, Stiglitz (1973) and Hennessy and Whited (2004) both reflect the fundamental distinction that generally taxes are due on distributions from firms to investors, but not on funds that investors provide to firms.

Dynamic trade-off models can also be used to consider the option values embedded in deferring leverage decisions to the next period. Goldstein et al. (2001) observe that a firm with low leverage today has the subsequent option to increase leverage. Under their assumptions, the option to increase leverage in the future serves to reduce the otherwise optimal level of leverage today. Strebulaev (2004) analyzed a model quite similar to that of Fischer et al. (1989) and Goldstein et al. (2001). Again, if firms optimally finance only periodically because of transaction costs, then the debt ratios of most firms will deviate from the optimum most of the time. In the model the firm leverage responds less to short run equity fluctuations and more to long run value changes.

Hennessy and Whited (2004) consider the interaction of financing and investment in a model with corporate and personal taxes, financial distress costs, and equity flotation costs. In contrast to many of the earlier papers, the firm is not obliged to pay out funds and so it allows for an explicit analysis of the kinds of dynamic considerations discussed in the two examples presented earlier in this section. They find that optimal leverage is path dependent and that profitable firms tend to be less highly levered.


12 A variety of other dynamic agency models have been proposed such as Morellec (2004) and Mello and Parsons (1992). Optimal capital structure can also be considered from an optimal dynamic contracting perspective as in Atkeson and Cole (2005). Titman and Tsyplakov (2004) study the difference between firm value maximization and equity value maximization.
Lewellen and Lewellen (2004) argue that if a firm repurchases shares, the tax that must be paid by the shareholders depends on the capital gains that has taken place since they bought in originally. Accordingly the optimal financing of the firm may depend on how frequently their shares are turned over in the stock market. Firms with many long-term shareholders may be more reluctant to trigger a tax bill for their shareholders than would a firm with many short-term shareholders.\footnote{Green and Hollifield (2003) provide a careful analysis of many of the complexities that arise due to personal taxes. However they simplify the analysis by assuming that corporate debt policy is to keep the interest payments fixed from period to period.}

Certain ideas are fairly general in dynamic models. The optimal financial choice today depends on what is expected to be optimal in the next period. In the next period, it may be optimal to raise funds or to pay them out. If raising new funds, it might be optimal to raise them in the form of debt or in the form of equity. In each case, what is expected to be optimal in the next period will help to pin down the relevant comparison for the firm in the current period. By stressing different costs, different dynamic models lead to somewhat different conclusions.

The idea that the rate of return in the hands of the firm needs to be compared to the rate of return in the hands of the investor is fairly general and seems to transcend specific models. The fact that transaction costs and taxes can create wedges that lead to times when money should be left in whichever hands it currently sits is also quite general and will recur across many models.

As stated earlier, there is an asymmetry created by the fact that payments by firms to investors trigger taxation, but payments by investors to firms do not do so. This asymmetry seems to be fairly basic, and it is likely to arise in many dynamic models. Both taxes and transactions costs can create wedges such that shocks are not undone. This leads to path dependent solutions in a variety of models.

Much of the work on dynamic trade-off models is fairly recent and so any judgements on their results must be somewhat tentative. This work has already fundamentally altered our understanding of mean reversion, the role of profits, the role of retained earnings, and path dependence. As a result, the trade-off class of models now appears much more promising than it did even just a few years ago.
2.4 Pecking Order

The pecking order theory stems from Myers (1984) who in turn was influenced by the earlier institutional literature including the book by Donaldson (1961). Myers (1984) argues that adverse selection implies that retained earnings are better than debt and debt is better than equity. This ranking was motivated with reference to the Myers and Majluf’s (1984) adverse selection model. The ordering, however, stems from a variety of sources including agency conflicts and taxes\textsuperscript{14}

**Definition 3** Myers (1984) A firm is said to follow a pecking order if it prefers internal to external financing and debt to equity if external financing is used.

This definition can be interpreted in different ways. What does it mean to “prefer” internal financing? Does this mean that the firm uses all available sources of internal finance before using any debt or equity issues? Or does this mean that, “other things equal”, the firm will mostly use internal financing before using external financing? If the verb “prefer” is interpreted strictly the theory is more testable. If “prefer” is interpreted in the “other things equal” way, then any test of the theory rests on the specification of “other things equal.”

Most firms hold some internal funds (cash and short-term investments) even when raising outside funds. This is so obvious that it is rarely considered in tests of the pecking order. It is implicitly assumed that these funds are held for reasons that are outside the theory, such as for transactions. Accordingly, almost all discussions maintain some version of an “other things equal” interpretation of the relative use of internal and external funds.

A second problem for the definition concerns the preference of debt over equity. As we will see, initial claims for the theory tended to rest on a strict interpretation in which equity is never issued if debt is feasible. As it has become increasingly clear that this strict interpretation is not only more refutable, but actually refuted, proponents of the pecking order theory have moved increasingly to the “other things equal” interpretation. Different papers invoke different empirical versions of “other things equal.” Of course, the more a test depends on the other things, the less the data is explained by the pecking order itself.

\textsuperscript{14}Baker et al. (2004) point out that excessive managerial optimism might also be used to generate a version of the pecking order if it were the only distortion.
At what point is equity introduced? The strict interpretation suggests that after the IPO, equity should never be issued unless debt has for some reason become infeasible. This leads to the notion of a “debt capacity.” The debt capacity serves to limit the amount of debt within the pecking order and to allow for the use of equity. Obviously, this raises the problem of defining the debt capacity. The literature provides no agreed-upon definition. Several recent papers have used factors commonly employed in tests of the trade-off theory, in order to define the debt capacity. Of course, this leads to difficulties in interpreting the results.

Pecking order models can be derived based on adverse selection considerations, agency considerations, or other factors. There seem to be a couple of common features that underlie pecking order theories. The first feature is the linearity of the firm’s objective function. This helps because it means that costs tend to drive the results to corner solutions. The second common feature of pecking order models is the relative simplicity of the model. The pecking order hierarchy is a relatively simple structure. A model that is complex is unlikely to have such a simple solution. When many things are factored in, a more complex range of things tend to happen. Thus, it seems that the pecking order is generally more likely to emerge from an illustrative model than it is from a unifying model.

While this section describes pecking order models based on adverse selection and agency costs, Section 2.3.2 shows that tax considerations alone can also generate pecking order behavior. It is also possible to have other features that lead to a financing hierarchy. To the best of our knowledge, no one has tried to distinguish among the alternative possible sources of pecking order behavior.

### 2.4.1 Adverse Selection

The most common motivation for the pecking order is adverse selection developed by Myers and Majluf (1984) and Myers (1984). The key idea is that the owner-manager of the firm knows the true value of the firm’s assets and growth opportunities. Outside investors can only guess these values. If the manager offers to sell equity, then the outside investor must ask why the manager is willing to do so. In many cases the manager of an overvalued firm will be happy to sell equity, while the manager of an undervalued firm will not. Our presentation follows Cadsby et al. (1990).
There are an original owner/operator of a firm and potential investors. Everyone is risk-neutral, and there are no transaction costs and no discounting. All financing is through equity. The firm has some existing assets and it decides whether or not to undertake a project. If the project is to be undertaken, then the potential investors compete in an auction for the right to finance the project. The auction is for a share of equity in the firm that the investor demands in exchange for the necessary funding of the project. Accordingly financing is break-even given the beliefs of the investors.

The firm has assets in place, denoted by $A_i$, and access to a positive net present value project that offers a net payoff denoted by $B_i$. The subscript $i$ refers to the firm’s type, which can be either type H (high) or of type L (low). The sum of the assets in place plus the net value of the project is greater for a type H firm than it is for a type L firm. The two types are equally likely. The firm knows the true worth of both its assets and the project. The investors can only guess about the firm’s type. In order to undertake the project, the firm would need to raise $I > 0$ from the investor.

If the project is not undertaken, then the firm’s value (denoted $V_i$) is just $V_i = A_i$. If the project is undertaken $V_i$ must be shared with the outside investor. The investor’s share of the firm is denoted $s$, so the original owner gets $(1 - s)V_i$. An auction is held among the risk-neutral investors for the right to provide $I$ in exchange for $sV_i$. The winner of the auction expects to break even.

There is a unique pooling equilibrium in which both type H and type L firms undertake the new projects if and only if $(I/V_L) < (B_H + I)/V_H$. The investor gets a share denoted $s^*$, where $s^* = I/(0.5V_H + 0.5V_L)$.

The pooling equilibrium conditions allow the investor only to expect to break even on average since both types of firm will undertake the project. Under the parameter value restriction, the new project is sufficiently lucrative that the high type firm wishes to go ahead, despite the fact that the investor is only financing the project on average terms. Thus, all players are willing to follow the suggested strategies.

There is a unique separating equilibrium in which a type L firm undertakes the project and a type H firm does not, if and only if $(B_H + I)/V_H < I/(0.5V_H + 0.5V_L)$. The investors get a share $s^* = I/V_L$.

In this case, only the low type firm goes ahead with the project. The investor knows that a low-type firm is being financed and therefore demands terms that reflect this fact.
If a high-type firm were to go ahead, the investor would demand the same unattractive terms required from low-type firms. As such, the high-type firm finds it better to simply forgo the project altogether. The parameter values are such that the suggested strategies reflect each player’s self-interest given how all the other players are acting.

Both a pooling and a separating equilibrium exist simultaneously when \( I/(0.5V_H + 0.5V_L) < (B_H + I)/V_H < I/V_L \). The investor shares depend on whether the equilibrium is pooling or separating. The investor always expects only to breakeven. Cadsby et al. (1990) point out that in the overlapping region, there is also a semi-separating equilibrium.\(^\text{15}\)

In the pooling equilibrium the asymmetric information does not cause the valuable project to be lost. But if the value of the assets in place is quite high relative to the value of the positive net present value (NPV) of the project, then the firm chooses not to raise any outside funds.

In this model, internal financing when feasible would always work. That is to say, such financing would avoid all asymmetric information problems. External equity is sometimes too expensive and the firm will even give up positive NPV projects to avoid it. This is part of the pecking order hierarchy.

As in Myers and Majluf (1984), debt is not formally included in the analysis. If debt were available and risk-free, it would work as well as internal financing. If debt is available and risky, then Myers (1984) argues intuitively that it ought to fall somewhere between retained earnings and equity thus creating the pecking order.

The formal analysis of a model with risky debt is not as simple as it seems when reading Myers (1984). When both debt and equity financing are feasible, there are often multiple equilibria, and it is not clear how to select among them. Noe (1988) provides an important analysis of the problem. Cadsby et al. (1998) provide experimental tests of some of the equilibrium selection arguments that have been invoked in financial theory. Path dependence and learning seem to play a more important role than do formal equilibrium selection criteria.

The subsequent theoretical literature has considered many versions of adverse selection problems. Generally, the results are not as elegant as the standard pecking order

\(^{15}\text{Cadsby et al. (1990) conducted experimental tests of the model. The model predicted well. Cadsby et al. (1998) also considered an extended version of the model in which the firm could advertise its type. In this case, the predictions of the model were not as good.}\)
suggests. For example, Myers and Majluf’s (1984) original adverse selection model assumes one-sided asymmetric information in which a firm selects securities for cash. However, if information asymmetry is two-sided (as in Eckbo et al., 1990), there are several possible equilibria leading to the firm’s preference for stock, or a combination of stock and cash over pure cash. Thus, in mergers with two-sided information asymmetry, firms sometimes actually prefer stock transactions over cash transactions.

Dybvig and Zender (1991) show that properly designed managerial compensation contracts (with compensation tied to the value of the firm) could solve adverse selection problems. However, in practice, one rarely observes managerial compensation contracts that are linked to firm value; they are mostly tied to equity value. Viswanath (1993) considers a world with more than one period and he finds that the results depend on how the first- and the second-period uncertainties are related. Ravid and Spiegel (1997) consider adverse selection with no assets in place to start with. This results in entrepreneur and the investor splitting the proceeds. In their setting, as in the examples discussed above, firms will use riskless debt before turning to equity financing.

Eckbo and Masulis (1992) and Eckbo and Norli (2004) extend the basic adverse selection model to allow for current shareholder participation in equity issue and underwriter quality certification. Adverse selection would be less severe if current shareholders were allowed to participate in the equity issue. In their model, firms that expect a high proportion of their current shareholder to take-up new issues face low adverse selection and prefer to issue uninsured rights. Firms with expectations of low current shareholder take-up prefer to issue equity using firm commitment underwritten offerings. Firms with expectations of intermediate current shareholder take-up issue equity using standby rights. This implies what might be termed a pecking order of equity floatation method choices.

Halov and Heider (2004) argue that the standard pecking order is a special case of adverse selection. When there is adverse selection about firm value, firms prefer to issue debt over outside equity and standard pecking order models apply. However, when there is asymmetric information about risk, adverse selection arguments for debt apply and firms prefer to issue external equity over debt. Thus, adverse selection can lead to a preference for external debt or external equity depending on whether asym-
metric information problems concern value or risk. The main conclusion is that adverse selection models can be a bit delicate. It is possible to construct equilibria with a pecking order flavor. But adverse selection does not imply that pecking order as the general situation.

2.4.2 Agency theory

The idea that managers prefer internal financing to external financing is, of course, old (e.g., Butters 1949). Traditionally the argument was that outside financing required managers to explain the project details to outside investors, and expose themselves to investor monitoring. Managers dislike this process. Thus, managers have a preference for retained earnings over external financing but their is no direct prediction about the relative use of debt versus equity when seeking external financing. These ideas were subsequently developed into agency theories with Jensen and Meckling (1976) being a prominent contribution.

Myers (2003) points out that some versions of agency theory imply a financing hierarchy. Agency costs of equity, for example, could result in a pecking order. Consider a simple and conventional example of the agency cost of equity that follows Jensen and Meckling (1976). The firm is owned and run by an entrepreneur. She has $R$ dollars; if she invests all of $R$ then her return is $V(\text{R})$ with $V' > 0 > V''$. Her consumption of desirable perks is the difference between, $R$, and the amount that she chooses to invest. Let the amount of investment be $I$. With no outside financing her problem is:

$$\max_I \quad V(I) + (R - I)$$

$$\text{s.t.} \quad I \leq R.$$ (4)

This gives the obvious first-order condition, $V' = I$ if the constraint is not binding. Let $I^*$ denote the solution to this first-order condition. This gives her a payoff of $V(I^*) + R - I^*$.

What happens if the constraint is binding so that $I^* > R$? Then, outside financing is interesting. Assume financing is with risk-less debt. Then, she asks for $I^* - R$ and promises to repay $D$. The entrepreneur invests optimally and repays properly. There is no distortion. If internal financing is inadequate, then risk-free external debt does
not cause any distortions.

Introduction of equity into the model requires a notion of exogenous debt capacity that becomes binding at some point. For simplicity, we directly assume that outside financing takes the form of equity $E$ and that the entrepreneur cannot commit to not consume the perks. The outsiders will get a fraction $1 - s$ of the firm. The amount raised will be $E = (1 - s)V(I)$. Thus, the problem for the entrepreneur is now:

$$ \max_I \quad sV(I) + R + E - I $$
$$ s.t. \quad I \leq R + E. $$

The associated first-order condition is $sV'(I) = 1$. The solution is denoted $I^{**}$. As long as $s < 1$, then $I^{**} < I^*$ and the entrepreneur is underinvesting. She bears the full cost of any perks not consumed and she must share the benefits.

Obviously, this underinvestment is inefficient. Use of internal financing would result in higher welfare. Thus, retained earnings are preferred. Debt is just as good in this simple model. Equity is inefficient. We, therefore, have a version of the pecking order.

Jensen and Meckling (1976) also identified an agency problem of debt called risk shifting. The idea is that if the firm is operated on behalf of equity, only cash flows in non-bankrupt states matter. The firm will therefore tend to accept projects that are too risky but with large payoffs in good states. It is clear that this kind of behavior is sometimes observed when a firm is in desperate circumstances but the general importance of this kind of risk-taking behavior is under debate (see Parrino and Weisbach (1999)).

If both kinds of agency conflicts are at work, then their relative importance is unclear. One might imagine that they balance at an interior optimum as in the trade-off theory. However the details of conflicting investment incentives can lead to complex problems, as suggested by Berkovich and Kim (1990). Eventually dynamic agency models such as Morrellec (2004) and Atkeson and Cole (2005) and dynamic trade-off models such as those discussed in section 2.3.2 are likely to go a long distance towards closing theoretical gaps between the various approaches to leverage. It seems likely to happen over the next few years.
3 Evidence

The available evidence on capital structure is organized as follows. Evidence on financing decisions at the aggregate level is provided in Section 3.1. A review of cross-sectional evidence on capital structure is given in Section 3.2. In Section 3.3, we examine evidence on leverage changes and discuss the tests of the pecking order theory and tests of mean reversion. Evidence on capital structure changes from event-studies is presented in Section 3.4 and evidence from natural experiments is given in Section 3.5. Finally, the evidence from surveys of corporate managers is reviewed in Section 3.6.

3.1 Financing Decisions at the Aggregate Level

How has leverage changed at the aggregate level? How do firms finance imbalances between investments and internal cash flow? Do they issue debt or equity? Who holds debt and equity claims in the economy? Who are the major issuers and purchasers of debt and equity claims? The aggregate data help in answering these questions. In addition, it provides an understanding of the differences between private and public firms since the U.S. Flow of Funds data include both. By contrast, much capital structure research examines the publicly traded firms included in the Compustat files. Comparing the Compustat data with the U.S. Flow of Funds data reveals many similarities in capital structure decisions of private and public firms. But there are also important differences. However, the greatest differences appear when we examine the financing behavior of small and large public firms.

The aggregate series for the US non-farm non-financial sectors are taken from the Federal Reserve’s Flow of Funds Statistics (Federal Reserve 2003). The data cover the period from 1945-2002. The level data are taken from the Table L.102, the balance sheet data is taken from the Table B.102, and the flows are obtained from the Table F.102. To examine public and private firms separately, an aggregated annual series for publicly traded firms is constructed first. The difference between the series for the entire economy and the series for the publicly traded firms provides the series for the private firms. The publicly traded firm series is constructed by aggregating Compustat-listed firms. Excluded are firms identified on the database as private and foreign-incorporated firms and firms with SIC codes less than 1000 and between 6000 and 7000.
3.1.1 Balance Sheet

The aggregate balance sheet data in Table 1 shows the remarkable stability of leverage ratios over the last half century. Debt neither vanishes from corporate accounts, nor does it explode to overwhelm equity. Aggregate leverage seems to be quite stationary. The evidence from before the 1950s is much sketchier but what is known reinforces this basic sense of stability. Wright (2004) provides a useful compilation of data about the corporate sector from 1900 onwards. Aggregate debt and aggregate equity both grow decade by decade. While leverage fluctuates during 1900-2002, it stays within rather narrow bounds. It is remarkable how similar leverage ratios are to each other in year 1900 and in year 2002. This is despite phenomenal changes in many features of the business environment during this period.

**Stylized Fact 1** Over long periods of time, aggregate leverage is stationary.

This fact places important limits on theory. It means that a satisfactory theory must account for why firms keep leverage stationary. Or else, the theory must explain why the environment serves to maintain the leverage despite managerial indifference. The market leverage ratios increased during the 1970s and the 1980s, perhaps caused by increases in the mergers and acquisitions and in leveraged buy-out activity, but they subsequently fell to the long-term average of about 0.32.

**Stylized Fact 2** Over the past half century, the aggregate market-based leverage ratio has been about 0.32. There have been surprisingly small fluctuations in this ratio from decade to decade.

Following Myers (1984), it may seem that the stability of aggregate leverage is consistent with the trade-off theory. In fact, there is too much stability for the simple version of tax versus bankruptcy theory. For most of the 1950s and the 1960s, the top

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17 Interestingly, the asset structure shows significant changes with large increases in the proportion of financial assets and decline in tangible assets. We observe that public firms hold considerably more tangible assets than do private firms. The large decline in tangible assets for the aggregate economy is primarily driven by private firms. We also find that, in recent years, public firms have noticeably higher book leverage than do private firms.

18 For example this poses problems for Welch (2004) who argues that changes in leverage do not get undone. Frank and Goyal (2004b) show that shocks in the equity market are cushioned by adjustments in the debt market in a manner that maintains the leverage ratio.

19 In a trade-off theory, if taxes affect the mix between debt and equity, then it is possible that the Tax Reform Act of 1986 increased the attractiveness of debt during the 1980s, see Givoly et al (1992).
corporate tax rate was roughly 50% (see Taylor, 2003). In the 1990s, it was around 35%. Despite this large difference in tax rates, the market leverage ratio averaged 0.32 in both the 1950s and in the 1990s; while in the 1960s it averaged 0.27. Have bankruptcy costs really fluctuated in just the right manner to account for this evidence? It seems hard to imagine. This evidence, while not a proof, is certainly a serious warning sign for the trade-off theory. The remarkable stability of leverage ratios also poses a problem for the pecking order theory. Leverage should fluctuate as the financing deficit ebbs and flows according to the standard pecking order theory. In order to account for this evidence something must be added to the basic pecking order theory.

3.1.2 Cash Flow Statements

Aggregate cash flow data (reported in Table 2 and plotted in Figure 1) show that dividends, capital expenditures and net debt issues all fluctuate, but are rather stable over the last half of the twentieth century. The fact that aggregate dividends have not changed much contradicts some of the recent literature that finds declining dividends from US firms. It is possible that the aggregate data mask a lot of heterogeneity in dividend decisions of firms and that large increases in dividends by a certain sector of the economy offset increasing numbers of non-dividend paying firms.

Net debt issues finance a large part of the financing deficit. Equity issues are negative and debt issues exceed the financing deficit during the last two decades, suggesting that firms issued debt to finance debt for equity swaps. While such swaps do take place, it is likely that debt-financed takeovers contribute more significantly to explaining these patterns.

Considerable heterogeneity exists between small public firms and large public firms and between private and public firms. Figure 2 plots the flow variables for large public firms (defined as firms whose book assets are in the top one-third of all publicly traded firms each year). For these firms, capital expenditures and internal funds are highly correlated. Debt issues track financing deficits.

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20It is worth observing that the recent dynamic models that are supportive of the trade-off theory tend to use relatively recent data. For example Hennessy and Whited (2004) study data from 1993-2001.

21Faulkender and Petersen (2003) and Lemmon and Zender (2004) draw a distinction between firms with and without a credit rating. Those with a credit rating have easier access to public debt markets and thus use more debt financing. Empirically, it is likely that the large firms considered in Figure 2 are generally the firms with good credit ratings.
The flow variables for small public firms are shown in Figure 3. Small public firms are defined as firms in the bottom one-third in terms of book assets among publicly traded firms each year. For these firms, capital expenditures exceed internal funds and the net equity issuances and the financing deficit appear to be strongly correlated. Debt issues are fairly minor. Thus, important differences exist between large and small firms in how they finance their deficits. Large firms issue debt to finance deficits while small firms issue equity.

Figure 4 plots the data for private firms. Capital expenditures tracked internal funds up until the mid-1980s but since then internal funds have exceeded capital expenditures. Debt issues and deficit show a closer relation than equity issues and deficits.

Several other differences between public and private firms are worth noting. Public firms are more profitable, invest more, and use more external financing (particularly equity). Private firms seem to have been increasing their dividends over time.

Figures 1 to 4 illustrate clearly that equity financing is more important for small public firms than it is for either private firms or large public firms. Presumably for many small public firms, the desire to issue equity easily induced them to go public in the first place.

**Stylized Fact 3** At the aggregate level capital expenditures are very close to internal funds, although they are generally lower. This is true of large public firms and private firms. This is not true for small public firms.

**Stylized Fact 4** At the aggregate level, the financing deficit is very close to debt issues. This also holds for large public firms and for private firms. This does not hold for small public firms. For small public firms, the financing deficit very closely matches equity issues.

**Stylized Fact 5** Aggregate dividends are very smooth and almost flat as a fraction of total assets for all classes of firms. There has been remarkable stability in the aggregate dividend rate over time. Large public firms pay higher dividends than do small public firms. Many small firms pay no dividends.

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22 This is somewhat puzzling. The aggregate Flow of Funds data say that dividend ratios have not changed. Evidence from large public firms suggests some decline, as observed by Fama and French (2001). Since small public firms pay almost no dividends, adding up the evidence seems to imply that private firms must be making up the difference through increased dividends. It would be nice to have direct evidence of such a change.
The evidence from before the 1950s is, as usual, quite a bit sketchier than is the subsequent evidence. Taggart (1985) suggests that stock issues were more important before the Second World War relative to those during the 1960s and 1970s. He also reports that during the 1930s aggregate total corporate debt declined, as internal funds exceeded the uses of funds. Presumably this reflects the struggle of firms to stay afloat during the depression. Graham and Krishnamoorthy (2004) provide an interesting study of the Depression period.

3.1.3 Holdings of Corporate Financial Claims

According to the Fisher Separation Theorem (Hirshleifer 1958), with complete markets, investors are unanimous about how the firm should be run. It does not matter who provides the firms with funding. However, when markets are incomplete, it is well known that differences of opinion can matter and investor clientele effects may be important. Accordingly it is of interest to examine what we know about the providers of funds to different sectors of the economy.

Corporations raise funds from the rest of the economy. These funds come in the form of equity and debt. By definition, all debt and equity is owned either directly or indirectly. Indirect ownership happens through a variety of institutional forms including banks, insurance companies, pension funds, and mutual funds. The markets for corporate debt and equity must reconcile investor demands with the willingness of firms to supply debt or equity. In the Flow of Funds data, debt and equity claims can be viewed as being issued by three major sectors of the economy: non-financial US corporations, US financial firms, and the rest of the world. The claims are purchased and held by six major sectors: households, government, the rest of the world, banks, insurance companies, and funds.

Table 3 provides aggregate data on the issuers and investors of bonds and equity. First consider the bond market. Five major sectors held most of the debt issued by the business sector in the 1990s. These sectors are: households (14 percent of aggregate debt), insurance companies (40 percent), the rest of the world (20 percent), pension and

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23The idea that investor clienteles might play an important role in capital structure goes back at least to Schwartz (1959). He suggested thinking about optimal capital structure in terms of monopsonistic discrimination against outside investors. The focus of the profession at this time was on making sense of Modigliani and Miller (1958) and Schwartz’s paper did not receive much attention.
mutual funds (17 percent) and banks (9 percent). Over time, insurance companies have dramatically reduced their holdings of corporate debt while the pension and mutual funds and the rest of the world have increased their holdings of corporate debt.

Bond issuers have also changed. The U.S. non-financial corporate sector issued almost 90 percent of debt outstanding in the 1950s. The financial sector played a minor role and its outstanding debt as a fraction of total debt was only about 1 percent. But, by the 1990s, debt issued by the U.S. non-financial corporate sector declined to only about 44 percent; the financial sector debt now exceeds debt from the non-financial corporate sector.

The equity issued by financial firms has also grown relative to that issued by non-financial corporate firms. Growth in equity issued in the U.S. by the rest of the world is even more impressive. In the 1950s, equity issued by the rest of the world as a fraction of total equity outstanding was less than 1 percent. By the 1990s, this number had increased to about 10 percent. About 70 percent of equity in the 1990s was issued by the non-financial corporate sector. The financial sector issued another 20 percent.

The direct holdings of equity by households have declined sharply. Equity ownership by insurance companies and by funds have increased as has foreign ownership of US equity. In the 1990s, corporate equity was held heavily by households (39 percent of the aggregate equity outstanding), pension and mutual funds (20 percent), insurance firms (28 percent), and the rest of the world (10 percent). Banks and government do not hold much corporate equity.

**Stylized Fact 6** Over the past half century, there has been a large decrease in direct holding of corporate securities by households and a corresponding huge increase in financial intermediation of such claims.

This growth in intermediation may be important. It is possible that in incomplete markets, mutual funds and insurance firms have different views about the appropriate rate at which they discount the future. Mutual funds may be more interested in the short term, while insurance firms may be more interested in the long term. Since 1980, the importance of insurance firms as financial intermediaries has been relatively constant, but the importance of mutual funds increased explosively over that period.24

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24There is also some evidence that the traditional role of the bank loan has been changing, at least
The change in intermediation is also important with respect to taxation. Many intermediaries pay no tax on dividends or capital gains. Depending on the type of account held by the ultimate owner, there may even be no applicable personal tax to pay. This reduces the effect of taxes on capital structures (see McDonald, 2004). If taxes were the full story, then all equity ought to flow into tax-advantaged accounts. While there has been a significant flow in that direction, the flow has not resulted in all equity being held in tax-advantaged accounts.

3.1.4 Flows of Corporate Financial Claims

Another perspective on capital structure decisions comes from examining the aggregate flows of corporate financial claims. Table 4 reports debt and equity issuances and purchases by various sectors of the economy. Consistent with the increasing share of financial sector debt, financial firms have become significant issuers of corporate debt. By the 1990s, financial sector debt issuances exceeded those by the non-financial corporate sector. The debt issuances by the rest of the world have declined over time. Corporate debt is bought heavily by insurance firms, funds, and the rest of the world.

The net equity issuances by the US non-financial corporate sector have been negative since the 1980s. The net issuances are defined as new equity issues less repurchases less cash-financed takeovers. Both stock repurchases and cash-financed takeovers have become more important in the 1980s and in the 1990s. The negative net equity issuances imply that new equity issues by U.S. firms together with positive net equity issuances by the rest of the world have not been enough to offset aggregate repurchases and takeover distributions. At times, cash-financed takeover distributions have been more important than share repurchases (Wright (2004) and Holmstrom and Kaplan (2001)). The connection between M&A activity and leverage deserves more attention since M&A activity is an important method by which firms exit. According to Maximovic and Phillips (1998), it avoids at least the direct costs of bankruptcy.

Corporate equity is bought mostly by the rest of the world and mutual funds. Households have been the net sellers of corporate equity since the 1960s. Households get equity in several ways. They get it through entrepreneurship when they create a

for large firms. In many cases banks seem to have resold the loans in a secondary market. Sufi (2005) reports that in recent years more than 15% of non-financial U.S. corporate debt comes by means of a loan syndicate rather than from a single source.
firm that did not previously exist. They get it when retained earnings increase the value of their existing equity holdings. They get it as compensation for labor, for example, through employee stock ownership plans, stock options, and stock grants.

**Stylized Fact 7** Households have been net suppliers of corporate equity since the 1960s. Corporations have been net buyers of equity since the 1980s. Most equity is no longer held directly. Insurance companies, mutual funds, and pension funds now hold more direct equity and debt than do households.

### 3.2 Leverage Differences Between Firms

Cross-sectional tests of capital structure theories examine if debt ratios vary across firms as predicted by the theory. Two strands can be distinguished. The bulk of this literature is concerned with determining which factors are correlated with leverage. This literature is fairly extensive and includes contributions by Bradley et al., (1984), Long and Malitz (1985), Titman and Wessels (1988), Crutchley and Hansen (1989), Smith and Watts (1992), Rajan and Zingales (1995) and Frank and Goyal (2004a). Harris and Raviv’s (1991) survey of these studies has also been influential. A second strand of this part of the literature is concerned with the debt conservatism puzzle. This puzzle comes from the allegation that many (or all) firms have lower leverage than would maximize firm value from a static trade-off perspective. Contributions include Miller (1977), Graham (2000), and Ju et al. (2004).

#### 3.2.1 Leverage definition and other econometric issues

In testing which factors are correlated with leverage, it is necessary to define leverage. Many different empirical definitions have been used. A key issue has been whether to examine book leverage (debt divided by total assets) or market leverage (debt divided by the sum of book debt plus the market value of equity). Early empirical work tended to focus on book leverage. Myers (1977) argued that managers focus on book leverage because debt is better supported by assets in place than it is by growth opportunities. Book leverage is also preferred because financial markets fluctuate a great deal and managers are said to believe market leverage numbers are unreliable as a guide to corporate financial policy.
Subsequent literature has given more attention to a market-based measure of leverage. Welch (2004), for example, argues that the book value of equity is primarily a ‘plug number’ that is used to balance the left-hand side and the right-hand side of the balance sheet rather than a managerially relevant number. He further objects that it can even be negative.25

Conceptually book and market leverage ratios are different. The book measure is backward looking. It measures what has taken place. Markets are generally assumed to be forward looking. Thus, there is no reason why these two concepts should match (see Barclay et al., 2003). As Table 1 shows, we do see a difference. Market-based leverage has been rather more stable over the decades than has book leverage.

Cross-sectional leverage studies must also confront other empirical issues. One issue is how to deal with the panel structure of the data. Typically, studies examine a large number of firms over a limited number of years. Thus, one has a panel in which the errors are unlikely to be independent. How should one adjust for this lack of independence? Different papers handle the problem in different ways. Particularly helpful coverage of this problem is provided by the panel data textbook by Baltagi (2001). Petersen (2004) provides a useful discussion that is more directly tied to corporate finance applications. In practice it is relatively common for studies to try more than one method of correction and then only focus on results that are robust across methods.

A second issue is how to deal with incomplete data in the panel. Many firms have only incomplete records. Typical studies drop firms that lack the necessary data items. Current versions of the standard econometric packages encourage this practice since they do it more or less automatically. The user might almost be unaware that firms are dropped. However this practice has its drawbacks. It creates a bias if the missing data are related to the process being studied. To get around this problem, statisticians such as Little and Rubin (2002) often recommend a process of “multiple imputation.”26 Essentially the observed data is used to make a best guess about the value of the un-

25Welch (2004) seems to prefer the use of interest coverage ratios. Frank and Goyal (2004a) show that, as an empirical issue, interest coverage ratios are not attractive. They lead to empirically fragile results. A focus on such fragile results might then serve to obscure the robust evidence that is obtained with the more popular measures.

26Currently SAS, S-plus and R all provide pre-coded routines to carry out multiple imputation. Some users have coded Stata routines to carry out multiple imputation as well and these are easy to obtain. Multiple imputation is not yet common in corporate finance but it seems quite likely that in the next few years this will become standard practice.
observed data. This is done several times to reflect the fact that there is uncertainty about the imputed values. Such a procedure can help mitigate the bias. Frank and Goyal (2004a) found that the main leverage factors discussed in this section are robust to whether one carries out multiple imputation or not. However, many of the minor factors are not robust in this respect.

A third common problem for such studies is how to deal with outliers. The standard data sources such as Compustat have a nontrivial number of observations that seem quite anomalous. For instance, data items that by definition cannot be negative are sometimes coded as negative. Sometimes data items are coded in ways that result in the balance sheet not balancing or the cash flow identities not matching up. In some cases a firm will have a value of some variable that is several orders of magnitude too large to be plausibly correct.

These “outliers” happen in too many cases for it to be practical to chase down and correct them from original sources such as company annual reports. So how should we deal with this problem? Several approaches have been used. Some studies simply ignore the issue. This is potentially serious since we know that outliers can generate seriously misleading conclusions. Most studies take some steps to deal with the problem. Three kinds of corrections are particularly common: rule of thumb truncations, winsorization, and robust regressions.

The most common method of dealing with the problem is to use some rule of thumb to remove data that is so extreme that “it cannot possibly be correct.” Different studies employ different rules of thumb so that one study might remove firms with a market-to-book ratio that is reported to exceed 5, while another study might remove only those that exceed 10. Many studies include some kind of minimum firm size criterion. When a study uses a variety of such plausible, but more or less arbitrary rules of thumb, it is difficult to be sure exactly how sensitive the results are to these truncations. In particular, multiple truncation rules might interact in surprising ways.

Recently, it has become more common to use winsorization, in which the most extreme tails of the distribution are replaced by the most extreme value that has not been

\[ \text{Data problems are much more common for small firms than they are for large firms. Some studies restrict attention to large firms and thus they largely avoid the main data problems. However, the results are then conditional on the firm size filter. It is disappointingly common for papers to use such a filter but then ignore the fact that the data have been filtered when discussing the results. As shown earlier there are important differences in how many small and large firms finance themselves.} \]
removed. It is particularly common to winsorize each tail at 0.5% or 1%. In essence this procedure amounts to saying: “I do not believe the data are correct, but I know that the data exist. So instead of completely ignoring the data item, I will replace it with something a bit more reasonable.” This procedure has the advantage that it is more systematic than pure rules of thumb and it is then easier to have consistency across papers. This kind of approach can be viewed as some type of a “poor man’s” Bayesian method. A prior is being imposed, but the full Bayesian machinery is not being used.

Another fairly common method is to run robust regressions. Most statistical packages currently include one or more types of robust procedure. The statistics literature contains quite a few alternative robust procedures. It is fairly common for empirical papers to use some type of robust regression procedure. Typically these are not reported as the main results. Instead, they tend to be relegated to footnotes.

A final issue concerns the assumptions to be made about the debt market. It is now common for papers to study the ratio of book debt to the sum of book debt plus market equity. This is often accompanied by an apology to the reader. Book debt is being studied due to the inconvenient fact that many (most?) firms do not have market traded debt. Thus only book debt numbers are available. Of course, this fact itself is informative and deserves attention. Why do so many firms have traded equity, while only relatively large firm have traded debt? Why is it that so much corporate equity is traded on organized exchanges while so little corporate debt is exchange trade? These are not merely a nuisance issues for empiricists. They are a first order fact about corporate debt that deserves attention.

3.2.2 Leverage Factors

The capital structure literature identifies a large number of cross-sectional variables that appear related with debt ratios. However, Frank and Goyal (2004a) show that only a small number of factors are actually empirically robust and financially significant. This section summarizes the predictions and the evidence for factors that exhibit the most robust correlation with leverage.

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28The popular package Stata includes the command “rreg”, which provides basic robust regression functionality. S-plus and R both provide much more complete sets of robust procedures.

29It does not seem to hard to imagine that the high fixed costs of entering public debt markets may play a role.

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Leverage and growth: The static trade-off theory predicts a negative relation between leverage and growth. Growth firms lose more of their value when they go into distress. Several agency theories also predict a negative relation between leverage and growth. For example, the underinvestment problem is more severe for growth firms leading these firms to prefer less debt. The underinvestment problem arises because firms with risky debt have an incentive to underinvest in positive net present value projects since shareholders bear the entire cost of the project but receive only a fraction of the increase in firm value; part of it goes to debtholders (see, Myers, 1977).

Asset substitution problem are also more severe for high growth firms. In high growth firms, it is easier for stockholders to increase project risk and it is harder for debtholders to detect such changes. Thus, debt is more costly for firms with high growth opportunities. Agency costs of free cash flow are less severe for growth firms (see Jensen (1986)) but this again leads to the prediction that high growth firms should have less debt. Debt mitigates agency costs of free cash flow in firms with low growth opportunities. Firms with good growth opportunities have less of a need for the discipline that debt provides. In summary, both the tax-bankruptcy cost trade-off and the agency theories are generally interpreted as predicting an inverse relation between the leverage ratio and growth opportunities.

By contrast, the pecking order theory predicts that firms with more investments - holding profitability fixed - should accumulate more debt over time. Thus, according to the pecking order theory, growth opportunities and leverage are expected to be positively related.

The relation between leverage and growth features in many different cross-sectional studies including those by Bradley et al. (1984), Long and Malitz (1985), Smith and Watts (1992), Barclay et al. (1995), Barclay et al. (2003) and Frank and Goyal (2004a). The ratio of market value of assets to book value of assets is a commonly used proxy for growth opportunities. The studies generally conclude that leverage is negatively related with market-to-book ratios, which is consistent with trade-off theories. Rajan and Zingales (1995) show that the negative relation between leverage and market-to-book ratios exists in all G7 countries.

Leverage and Firm size: Static trade-off theory is generally interpreted as predicting

30The board of directors may provide a more direct method of dealing with this problem as in Yen (2004).
that large firms will have more debt since larger firms are more diversified and have lower default risk. Larger firms are also typically more mature firms. These firms have a reputation in debt markets and consequently face lower agency costs of debt. Hence, the trade-off theory predicts that leverage and firm size should be positively related.

The pecking order theory is usually interpreted as predicting an inverse relation between leverage and firm size. The argument is that large firms have been around longer and are better known. Thus, large firms face lower adverse selection and can more easily issue equity compared to small firms where adverse selection problems are severe. There is an important caveat here. Large firms also have more assets and thus the adverse selection may be more important if it impinges on a larger base. Thus the pecking order prediction for firm size is ambiguous. Cross-sectional tests of the relation between leverage and firm size find the relation to be robustly positive.

Leverage and Tangibility of Assets: Tangibility of assets is typically measured by the ratio of fixed assets to total assets. Some studies construct a measure of collateralizable assets measured as the ratio of inventory plus net property plant and equipment to total assets and find a positive relation between leverage and the extent to which a firm’s assets are collateralizable.

Tangible assets are easier to collateralize and they suffer a smaller loss of value when firms go into distress. Thus, from a trade-off perspective tangibility has an important effect on the costs of financial distress. Tangibility also makes it difficult for shareholders to substitute high-risk assets for low-risk ones. Agency costs of debt are therefore lower for firms with more tangible assets. Both the static trade-off and agency theories predict a positive relation between leverage and tangibility of assets. Under the pecking order, Harris and Raviv (1991) argue that the low information asymmetry associated with tangible assets makes equity less costly, resulting in a negative relation between leverage and tangibility.

The relation between debt and tangibility of assets is reliably positive. Inventory is sometimes included and sometimes excluded in measures of tangibility. Empirically inventory seems to help explain the use of short-term debt much more than it helps to explain the use of long-term debt.\footnote{This has sometimes led to ideas of maturity matching. We do not pursue this idea here because to do so would require a more complete treatment of the various clauses and contingencies on debt contracts. Such studies are worthwhile, but they do not speak directly to Myers’ contest.}
Leverage and Profitability: Static trade-off theory predicts that profitable firms should have more debt. Expected bankruptcy costs are lower and interest tax shields are more valuable for profitable firms. Firms that generate higher profits relative to investments also benefit from the discipline that debt provides in mitigating the free cash flow problem (Jensen, 1986). The pecking order theory argues that firms prefer internal finance over external funds. If investments and dividends are fixed, then more profitable firms will become less levered over time.

The empirical studies typically find a negative relation between profitability and leverage. This negative relation is traditionally interpreted as being consistent with the pecking order theory and inconsistent with the trade-off theory. However, the theory is not quite so simple. Profitability also proxies for growth opportunities. If profitability is a less noisy proxy for growth than the market-to-book ratio, the negative sign on profitability is consistent with the predictions of the static trade-off theory. More importantly, as discussed in Section 2.3.2 in a dynamic model, the traditional interpretation might not be valid. Indeed both of the examples in that section illustrate that there are good reasons in a trade-off model for leverage to be negatively related to leverage. Thus the trade-off theory predictions on profit are ambiguous.

Leverage and Industry Median Debt Ratios: Industry leverage is a powerful predictor of firm leverage. Presumably, at least from a trade-off perspective, much of the power comes from the fact that industry reflects a number of otherwise omitted common factors (see Frank and Goyal, 2004a). Product market interactions are also important. As a result, the industry median leverage is likely to be a proxy for the target capital structure, albeit a noisy one. Hovakimian, Opler and Titman (2001) find that firms adjust their debt ratios towards industry median debt ratios. Mackay and Phillips (2004) provide a recent analysis of industry effects on leverage and show that there is significantly more variation in leverage within industries than across industries.

Leverage and Dividends: The static trade-off theory predicts that dividend-paying firms should have more debt if they are viewed as less risky. However, in a dynamic trade-off framework, firms with cash flows in excess of investments should pay the difference as dividends and not rebalance each period by issuing debt. In this case,

Chen and Zhao (2005) argue that neither transaction costs nor tax reasons can properly explain the negative relation between leverage and profitability. Thus, the best way to think about the relation between leverage and profits is not yet entirely settled.
leverage and dividends will be negatively related. If dividend-paying firms have lower agency costs of equity, then again dividends and leverage will be negatively related (Easterbrook, 1984).

The pecking order theory predicts that firms which pay dividends should become more levered. Dividends are assumed to be exogenous (see Shyam-Sunder and Myers, 1999). Accordingly, a dollar of cash outflow increases the financing deficit by a dollar. This increases the amount of debt the firm must issue in order to fill the deficit. The idea that dividends are exogenous may be too extreme. An alternative idea is that non-dividend firms have larger information asymmetries. That would cause them to prefer debt over equity. This suggests that non-dividend paying firms should have more debt.

As can be seen from this discussion, both theories lead to ambiguous predictions. Frank and Goyal (2004a) show empirically that leverage and dividends are negatively related. High dividend firms tend to have lower leverage.

Leverage and Expected Inflation: Taggart (1985) argues that features of the tax code suggest a positive relation between debt and expected inflation. The real value of tax deductions on debt is higher when inflation is expected to be high. Thus, trade-off theory suggests a positive relationship between leverage and expected inflation. A positive relation can also arise if managers time debt markets. If managers are timing, then they will issue debt when expected inflation is high relative to current interest rates.

Compared with the 1970s and the early 1980s, in recent years, inflation has not figured prominently in the academic literature on capital structure. However the effects continue to be present in the data. Frank and Goyal (2004a) shows that there is a robust positive relation between leverage and expected inflation.

Our interpretation of the evidence from cross-sectional tests of capital structure is summarized as follows.

**Stylized Fact 8** There is a core set of seven reliable factors that are correlated with cross-sectional differences in leverage. Leverage is positively related to median industry leverage, collateral, log of assets, and expected inflation. Leverage is negatively related to market-to-book, profits, and a dummy variable for a firm paying dividends.

Over time we have a improved our understanding of the factors that are empirically
related to leverage. Interpreting the evidence has remained difficult. Many variables could reasonably be interpreted as representing different theories of capital structure. Moreover, empirical specifications are linear even when some models contain non-linearities. Many tests are static even though the data are generated by the dynamics of firm financing decisions. Thus, cross-sectional variation in debt ratios may arise because either optimal ratios differ or the actual ratios diverge from optimal ones.

3.2.3 Debt Conservatism

Since at least Miller’s (1977) presidential address, there has been some concern about the seemingly low leverage of firms given the substantial tax benefits of debt. Miller argued that bankruptcy costs appear rather too small to offset the large tax subsidies of debt: “the great emphasis on bankruptcy costs in recent discussions of optimal capital structure policy seems to me to have been misplaced. ... the supposed trade-off between tax gains and bankruptcy costs looks suspiciously like the recipe for the fabled horse-and-rabbit stew – one horse and one rabbit” (Miller, 1977). Dynamic trade-off models of Kane et al. (1984) and Brennan and Schwartz (1984) considerably strengthened the idea that firms are underlevered relative to the predictions of the trade-off theory.

Starting with the rabbit part of the stew, a number of studies have attempted to quantify bankruptcy costs. Direct bankruptcy costs are indeed small (see Warner, 1977). Maksimovic and Phillips (1998) find that assets are often reshuffled between firms and so direct bankruptcy costs may not be very high. Indirect bankruptcy costs (Titman, 1984) are likely to be much larger but they have been difficult to quantify. A recent attempt at estimating bankruptcy costs by Andrade and Kaplan (1998) finds that for a sample of 31 highly leveraged transactions, bankruptcy costs are between 10 and 23 percent of firm value.

From a different point of view, Molina (2004) observes that many estimates of default costs such as that by Warner (1977) are ex post estimates. Default is endogenous to the leverage decision. Molina uses the firms’ past market valuations and marginal tax rates as instruments to estimate the effect of increasing leverage on the default probability. Ex ante costs of financial distress can be obtained by multiplying this estimated effect of leverage on the firms default probability with the previous estimates of ex-
post costs of financial distress. Molina finds that the ex ante costs of financial distress are comparable to the current estimates of the tax benefits of debt.

Turning to the horse side of the stew, Graham (2000) estimates tax rate functions to determine how aggressively firms use debt. He finds that a significant number of Compustat firms are surprisingly conservative in their use of debt. What is more, these are generally large, profitable, and liquid firms. It would seem that such firms would face low costs of distress and could have levered more. Graham (2000) concludes that capital structures of a significant number of U.S. publicly traded firms are leaving significant sums of money on the table.

A problem for all tests of taxes is that important elements of corporate taxes are what are called tax shelters. Information about these is very hard to find since the Internal Revenue Service (IRS) treats tax investigations confidentially. Graham and Tucker (2004) studied the results of an exhaustive search of Tax Court records and financial news stories. They were able to identify 44 tax-sheltering cases that involved 43 firms between 1975 and 2000. They find that firms with tax shelters use less debt as predicted by the static trade-off theory. Many scholar suspect that Graham and Tucker (2004) are only observing the “tip of the iceberg.” Unfortunately we have no direct way of knowing how significant such tax shelters really are.

Several recent papers attempt to reconcile the observed capital structures to those predicted by models. Minton and Wruck (2001) examine low leverage firms and find that the low leverage is largely transitory. These firms appear to be stockpiling financial slack or debt capacity, which is used later to make acquisitions and capital expenditures. The evidence provided by Minton and Wruck (2001) seems quite similar to example 2 in section 2.3.2.

Morrellec (2004) presents a contingent claims model with manager-stockholder conflicts. The model can generate the low debt ratios observed in practice. In another recent paper, Ju et al. (2004) present a dynamic framework that provides estimates of optimal capital structures based on a calibrated contingent-claims model. They show that firms are not underlevered relative to the predictions of their model. Maximizing share value for a firm that is calibrated to be similar to the median Compustat firm

\[^{33}\text{Note however, that this sounds suspiciously like the first example in section 2.3.2. Also, these firms may have high growth options and assets that are largely intangible. If so, then the agency costs of debt may be particularly large for this sample.}\]
results in an optimal debt-to-capital ratio of 15.29%, which is below the median Compustat debt-to-capital value of 22.62%. Their results contradict the view that firms are conservative in debt financing. Their results also show that moderate deviations of capital structure from optimal values have very small impact on firm value. Thus, in the presence of transaction costs, it may be optimal for firms to let their capital structure deviate from the target by substantial amounts. Hennessy and Whited (2004) and Strebulaev (2004) also dispute the claim that firms are underlevered relative to the predictions of dynamic trade-off models. Their models also appear to be capable of accounting for the observed corporate debt levels.

Debt conservatism has also been examined from a behavioral perspective\footnote{See Baker, Ruback and Wurgler (2004) for a review of behavioral approaches to corporate finance problems.}. Behaviorists frequently report that overconfidence is the single most important deviation from rationality. Hackbarth (2004) presents a model in which an overconfident manager chooses higher debt levels than will a rational manager. Malmandier and Tate (2004) report that, as an empirical matter, overconfident CEOs are more likely than other CEOs to raise debt (rather than equity) to cover financing deficit. They do not report on the magnitude of the effect. Instead of resolving the puzzle of why firms are under-levered these behavioral studies deepen the debt conservatism puzzle just as the rational models are coming to grips with the problem.

Our sense is that while the problem of debt conservatism has attracted a certain amount of attention, it is not a first-order problem for the trade-off theory. There are a variety of ways to generate ‘low’ leverage in simulations of quite conventional trade-off models.

### 3.3 Studies of Leverage Changes

Leverage can change due to an active decision of the firm to issue or repurchase securities. Leverage can also change when the firm’s circumstances change or when its stock price changes. Many studies therefore examine changes in leverage (e.g., Shyam-Sunder and Myers, 1999, Frank and Goyal, 2003). Some studies examine changes in equity (e.g., Fama and French, 2004, and Leary and Roberts 2004a). Frank and Goyal (2004b) examine both changes in debt and changes in equity in a two-equation VAR
system.

Before turning to the individual studies it is useful to examine the raw data on leverage changes. Table 5 shows the leverage transitions from one year to the next. The table reports market leverage adjustments. Book leverage adjustment transitions are essentially identical and thus omitted.

The bottom row of Table 5 indicates how common each leverage category is in the overall data. Most firms have leverage ratios between zero and 10%. As leverage increases the number of firms decline. Only 1.2% of firms have leverage greater than 90%. Large changes in leverage are quite rare in the sense that it is common for a firm to remain within the same category from one year to the next. When the firm leaves a particular category it typically moves to an adjacent leverage category. It is rather rare for a high leverage firm to dramatically cut leverage.

3.3.1 Tests of the Pecking Order

Changes in debt have played an important role in assessing the pecking order theory. This is because the financing deficit is supposed to drive debt according to this theory. Shyam-Sunder and Myers (1999) examine how debt responds to short-term variation in investment and earnings. The theory predicts that when investments exceed earnings, debt grows, and when earnings exceed investments, debt falls. Dividends are assumed to be sticky in the short term.

Tests of the pecking order theory define financing deficit as investments plus change in working capital plus dividends less internal cash flow. The theory predicts that in a regression of net debt issues on the financing deficit, the estimated slope coefficient should be one. The slope coefficient indicates the extent to which new debt issues are explained by financing deficits. Shyam-Sunder and Myers find strong support for this prediction in a sample of 157 large firms. The coefficient is 0.75 with an $R^2$ of 0.68 (see column 2 of their table 2). They interpret this evidence to imply that “pecking order is an excellent first order descriptor of corporate financing behavior” (Shyam-

Chirinko and Singha (2000) use several examples to illustrate that Shyam-Sunder and Myers’s tests have low power. They show that the slope coefficient could be less than one for a firm that strictly follows the pecking order. This may happen because equity issues, while at the bottom of the financing hierarchy, are still a substantial percentage of external financing. Chirniko and Singha also show that the coefficient on deficit could be close to one even when a firm violates the pecking order model, i.e., it issues equity before issuing debt or issues debt and equity in fixed proportions.
The evidence in Shyam-Sunder and Myers is based on a small sample of 157 firms. These are large firms that traded continuously during the 1971-1989 period. The question is what are the broad patterns of financing activity for a large cross-section of firms.

Frank and Goyal (2003) examine the broad applicability of the pecking order theory. Their evidence based on a large cross-section of US publicly traded firms over long time periods, shows that external financing is heavily used by some firms. On average net equity issues track the financing deficit more closely than do net debt issues. These facts do not match the claims of the pecking order theory. Greatest support for pecking order is found among large firms, which might be expected to face the least severe adverse selection problem since they receive much better coverage by equity analysts. Even here, the support for pecking order is declining over time and the support for pecking order among large firms is weaker in the 1990s. They conclude that the pecking order theory does does not explain broad patterns in the data.

**Stylized Fact 9** Firms adjust their debt frequently. The financing deficit plays a role in these decisions. The traditional cross-sectional factors, however, are more important than the financing deficit.

Lemmon and Zender (2004) attempt to reconcile the findings presented by Frank and Goyal (2003) and Fama and French (2002) with those presented by Shyam-Sunder and Myers (1999). According to Lemon and Zender, the idea of debt capacity is important in understanding the rejections of the pecking order theory. Consideration of debt capacity suggests that, when unconstrained by debt capacity, firms issue debt but, when constrained, they issue equity. These tests require a workable definition of debt capacity. If debt capacity is defined as the point when adding more leverage reduces firm value, then debt capacity is similar to the concept of target leverage as defined by the trade-off theory of capital structure. Thus, finding that firms use debt to fill the financing deficit when they are below their debt capacity may not sharply distinguish two theories.

Lemmon and Zender operationalize the concept of debt capacity by focusing on firms with rated debt. They argue that firms with debt rating are unconstrained by debt capacity while firms without debt ratings are constrained. Lemmon and Zender
find, as expected, that the coefficient on financing deficit in net debt regressions are significantly larger for firms with rated debt and smaller for firms with no rating. They also show that firms with no debt rating are small high-growth firms and they use equity to finance their deficits. These results are consistent with those in Frank and Goyal (2003) and Fama and French (2002). The interpretation, however, is different. While Frank and Goyal suggest that these firms face more asymmetric information problems and thus pecking order predicts that they should issue equity. Lemmon and Zender suggest that these firms are debt capacity constrained and therefore issue equity.

Another attempt to reconcile the evidence in Frank and Goyal (2003) with the predictions of adverse selection arguments is described in Halov and Heider (2004). The paper argues that when there is greater asymmetric information about risk, debt has a more severe adverse selection problem and firms would only issue equity. To test these arguments, Halov and Heider use asset volatility as a proxy for asymmetric information about risk and divide firms into deciles based on asset volatility. They show that as asset volatility increases, firms use more equity to finance their deficits. The interpretation of these results rests on the assumption that differences in asset volatility deciles capture differences in asymmetric information about cash flow variance. The mean of the distribution is common knowledge. Thus, small, young high growth firms will issue equity to finance the deficit if these firm have more asymmetric information about risk and less asymmetric information about value.

Helwege and Liang (1996) found that the use of external financing by firms that undertook an IPO in 1983 did not match the pecking order prediction that financing deficit is the critical factor. Leary and Roberts (2004a) find that when firms use external finance, less than 40% match the pecking order’s predictions. The pecking order accurately identifies less than 20% of the observed equity issuances. They study whether these rejections are due to debt capacity or time-varying adverse selection; they conclude that these suggestions do not account for the evidence.

Fama and French (2004) consider equity issuances. Most firms actually issue and/or retire equity in most years. There are many mechanisms by which equity is issued, not only SEOs. Many issues by large firms are fairly small. Violations of the pecking order are routine. More than half of the firms violate the pecking order when issuing equity. Gomes and Phillips (2004) find that half the equity issues are in the public market
while half are private issues. The pecking order provides a better account of the public
issues and has difficulty accounting for the private issues.

Korajczyk et al. (1990) find that debt ratios do not rise prior to equity issues. There
is also evidence that stock issues are typically followed by debt issues and therefore
leverage changes induced by equity issuances are only temporary (see Eckbo and Ma-
sulis (1995) and Alti (2004)).

**Stylized Fact 10** After an IPO, equity issues are more important for small firms than for large
firms. Many large firms issue significant amounts of equity infrequently. But when they issue
the issues can be large. Many small firms issue equity fairly often.

3.3.2 Tests of Mean Reversion

Static trade-off theory predicts a target debt ratio that depends on the tax benefits of
debt and the costs of financial distress. By relying on adjustment costs, this theory may
suggest a target adjustment process. As shown in Table 1, the aggregate data show
that in the US economy as a whole leverage is quite stable. Something must be causing
such stability. It could be caused by the mean-reverting actions of individual firms. Or
it could be caused by the process of firm entry and exit.

Empirical tests of target adjustments focus on two related questions. First, does
firm-level leverage reverts to a target? Second, what do firms do when actual debt
ratios deviate from the target?

Since the target is not observable, it must be estimated or its effects must be im-
puted. Early studies take a long-term average as the target. These early papers es-
timate target debt ratio as the average debt ratio across a sample period. Examples
include Taggart (1977), Marsh (1982), Jalilvand and Harris (1984), Shyam-Sunder and
Myers (1999). The approach assumes that firm characteristics that affect leverage re-
main unchanged over time. However, it is quite likely that the target changes over
time as firm characteristics change. For example, if firms issue equity after increases
in stock prices, one interpretation is that this action is inconsistent with firms targeting
debt ratios because it moves them further from their target. However, an alternative
interpretation is that stock price change reflects improvements in a firm’s investment
opportunity set. The improvement in growth prospects lowers the target debt ratio.
and the equity issuance decision is a rational response of the firm to move towards its new target ratio.

More recent studies, therefore, adopt a two-step procedure in which an equation for the target is estimated first and the fitted value is then substituted into the adjustment equation. Examples of this approach include papers by Fama and French (2002), Hovakimian, Opler and Titman (2001), Korajczyk and Levy (2003), and Kayhan and Titman (2004). The target factors are typically taken to be the same factors considered in Section 3.2. The difference between the target and actual is used to predict whether a firm issues debt or equity. It is also possible to substitute the target equation into the adjustment equation and then estimate the resulting structure as in Flannery and Rangan (2004). Flannery and Rangan (2004) provide a rather more careful treatment of the problems associated with dynamic panels than has been common in this literature.

Hovakimian, Opler and Titman (2001) test whether firms move to a target debt ratio when they raise new capital or repurchase existing capital. They use a two-stage estimation procedure. In the first stage, leverage is regressed on a vector of variables presumed to affect leverage targets. In the second stage, a logit regression predicting a firm’s financing choice is estimated as a function of the difference between the actual leverage and the estimated target leverage and other variables affecting the deviation of the actual debt ratio from the target. Hovakimian, Opler and Titman’s results show clear evidence that firms adjust towards target debt ratios. Firms issue debt when actual debt ratios are below the target debt ratio and they reduce debt when actual debt ratios are above the target. However, adjustments are stronger and more significant for debt reductions than they are for debt issuances. It is not clear why firms adjust more quickly when they are overlevered but not when they are underlevered.

Another test of mean reversion is reported by Fama and French (2002) who estimate a partial adjustment model with a two-step procedure. In the first step, they regress leverage on cross-sectional determinants of leverage. In the second step, they use the fitted values from this estimation as the proxy for target leverage in a partial adjustment model. Fama and French (2002) find that the mean reversion is between 7 and 10% for dividend payers and between 15 and 18% for dividend nonpayers.

The literature commonly agrees that leverage exhibits mean reversion. Mean reversion in leverage is in fact not surprising in light of the evidence that leverage has been
quite stationary over long periods of time. But there is significant disagreement over how rapidly the adjustment takes place. According to Fama and French, these speeds of adjustment imply that mean reversion is at “a snail’s pace”. Leary and Roberts (2004b) and Flannery and Rangan (2004) report evidence that reversion is quite fast – mostly accomplished in two to three years. Flannery and Rangan argue that in previous studies, target leverage is measured with error. This biases the coefficient of adjustment speeds downwards. Different methods lead to these different estimates of the speed. Thus, the speed of adjustment is not generally agreed upon. Alti (2004) also finds much faster adjustment of leverage.

Shyam-Sunder and Myers (1999) have argued that mean reversion is not necessarily incompatible with the pecking order. They argue that in a pecking order world in which firms do not have leverage targets one can get a false sense that leverage is mean reverting. This happens when capital investments are lumpy and positively serially correlated and free cash flows vary over the business cycle and average debt ratio is taken as target. Leary and Roberts (2004a) provide a helpful consideration of this issue.

Transaction costs are potentially quite important. As pointed out by Leary and Roberts (2004a) different forms of adjustment costs are likely to induce different patterns of leverage changes. Fama and French (2004) argue that there are many different ways to issue equity, and these are associated with differing levels of transactions costs. It is likely that the transactions costs that a firm faces when issuing a security are generally not the same as the transactions costs associated with repurchasing that same security. Thus it is likely that asymmetries should be found. (Of course, as pointed out by Stiglitz (1973) there is also an important asymmetry in the tax code.) Chen and Zhao (2005) find some evidence consistent with asymmetry.

The problem of estimating adjustments is not unique to corporate finance. It arises in several fields. Caballero and Engel (2003) consider the effect of using standard econometric techniques to estimate adjustment speeds when the adjustment is lumpy and infrequent. They report that the standard practice of estimating the speed of adjustment with partial-adjustment ARMA procedures substantially overestimates this speed. Since the adjustment speed methods used in the capital structure literature are closely related methods, the extent to which their concerns affect current estimates is
unclear. We summarize the evidence this way.\footnote{Caballero and Engel explain the bias as follows: “In linear models, the estimated speed of adjustment is inversely related to the degree of persistence in the data. That is, a larger first order correlation is associated with lower adjustment speed. Yet this correlation is always zero for an individual series that is adjusted discretely (and has i.i.d. shocks), so that the researcher will conclude, incorrectly, that adjustment is infinitely fast. To see that this crucial correlation is zero, first note that the product of current and lagged changes in the variable of concern is zero when there is no adjustment in either the current or the preceding period. This means that any non-zero serial correlation must come from realizations in which the unit adjusts in two consecutive periods. But when the unit adjusts in two consecutive periods, and whenever it acts it catches up with all accumulated shocks since it last adjusted, it must be that the later adjustment only involves the latest shock, which is independent from the shocks included in the previous adjustment.”}

**Stylized Fact 11** Corporate leverage is mean-reverting at the firm level. The speed at which this happens is not a settled issue.

Mayer and Sussman (2004) examine financing of unusually large projects. Investment spikes are financed with debt by large firms and with equity by small firms. New equity issues are associated with small, loss-making firms. They also observe a tendency to adjust back to previous levels of leverage after the spike. Kayhan and Titman (2004) also show that firms behave as if they have a target debt ratio. Their evidence suggests that investment needs, cash flows, and stock returns lead to transitory deviations from leverage targets but firms gradually undo these deviations.

Frank and Goyal (2004b) study a simple framework in which possible interactions between shocks to debt and equity are allowed to have both their own effects and cross-effects on subsequent issuing decisions. To do this, a two-equation VAR system in which cointegration is permitted is estimated. They find that shocks to equity value are followed by offsetting actions in the debt market. The fact that the offsetting actions take place in the debt market is directly relevant to studies of equity market timing and seems to contradict Welch (2004).

**Stylized Fact 12** At the aggregate level, leverage mean reversion mainly happens through debt market actions.

### 3.3.3 Exit

Bankruptcy has been heavily studied in its own right. Here we only make a few observations about the connection between exit and leverage. Bankruptcy and financial
distress play a crucial role in the trade-off theory. Generally it is thought that firms in trouble are highly levered. Table 5 provides some descriptive evidence. In every leverage category more than 5% of firms exit from one year to the next. As expected, exit is much more common for high leverage firms than for low leverage firms.

Bankruptcy is only one way, among many for a firm to exit. Table 6 decomposes the reasons for firm exit as listed by Compustat. By far the most common reason for exit is either an acquisition or a merger. This alone accounts for more than half of the identified cases. Actual identified bankruptcies and liquidations are surprisingly infrequent. However, it seems likely that the “other” category includes a fair number of otherwise unidentified bankruptcies.

**Stylized Fact 13** Mergers and acquisitions are more common reasons for exit than are bankruptcies and liquidations.

Firms that are financially distressed often take steps to try to mitigate their problems. Asquith, et al (1994) studied a group of firms that issued junk bonds and then got into financial distress. In addition to restructuring their finances, it was quite common for these firms to sell assets. Such asset sales appear to be limited by the state of the industry. Maksimovic and Phillips (1998) argue that in fact industry conditions are the key factor in asset redeployment. More controversially they suggest that firms in Chapter 11 face only minor bankruptcy costs.\footnote{Debate about the magnitude of bankruptcy costs goes back to Warner (1977). See also Andrade et al (1998).}

Exit by merger is quite different from exit by liquidation. Liquidated assets are likely to only receive low prices when sold piecemeal in the second hand asset markets. However firms that are taken over commonly receive a premium. Thus it is perhaps not too surprising that when a firm is getting into trouble, it might look for someone to acquire the firm as a going concern. To the extent that this takes place it mitigates the importance of direct bankruptcy costs.

### 3.3.4 The Effect of Current Market Conditions

How important are current market conditions for leverage adjustment choices? As a matter of theory, they might or might not be important. Intuitively, it seems that market
conditions ought to matter. For instance, when taking out a home mortgage it would not be unusual to look at the current term structure relative to historical norms, before deciding on the term to maturity and whether to take a fixed rate or a floating rate. Perhaps CFOs do the same. What is more, such behavior may not be so crazy. “naive investors, who judge bonds by their yields to maturity and buy long bonds when their yields are relatively high, have tended to earn superior returns in the postwar period in the United States.” (Campbell et al., 1997, pages 423-424.)

As a result it is not too surprising that there is evidence suggesting that current market conditions do play a role. As shown in Section 3.2, both the market-to-book ratio and the expected inflation rate are found to be significant factors in standard panel regressions. Both of these can be interpreted as an effect of market conditions. Frank and Goyal (2004b) find that aggregate corporate debt adjusts in reaction to the current market-to-book ratio. But neither the market-to-book ratio, nor the current interest rate seem to affect the aggregate long-term leverage ratio. There is good evidence that IPOs come in waves (Ritter and Welch, 2002) as do mergers (eg. Andrade, et al 2001).

Exactly how market conditions matter and how long lived the effects are, is much more controversial. At one extreme, Baker and Wurgler (2002) suggest that the effects are long lived. They report that firms that issued equity when market condition were good have lower leverage for a decade or more. They interpret this as support for the claim that leverage is determined by the attempt of firms to time the equity market. Chang et al. (2004) argue that information asymmetry in a firm’s incentives to time the market. They show that firms with greater analyst coverage have lower incentives to time the market. Firms followed by fewer analyst make infrequent but larger issues of equity. From a different point of view, Welch (2004) argues that shocks to a firm’s equity are not undone, and so the effects of equity shocks on leverage are effectively permanent.

Both of these ideas have been sharply challenged in several recent papers. First, it has been shown that such long lived effects are consistent with dynamic trade-off theories such as Hennessy and Whited (2004) and Strebulaev (2004). Similarly these models are able to replicate Welch’s (2004) regression results. Thus as a matter of theory, the evidence taken at face value, does not contradict the dynamic trade-off theory.

But not everyone is willing to take the evidence at face value. Alti (2004), Leary and
Roberts (2004a), and Kayhan and Titman (2004) have reported evidence that ‘market
timing’ effects are present, but that they have largely dissipated after a couple of years.
Huang and Ritter (2004) dispute this claim. This debate is intimately connected to the
tests of target adjustment. Recall that in Section 3.3.2 we found that the rate of mean
reversion is not a settled issue. Thus it is not surprising that the durability of the market
impact is also best regarded as an open issue.

The idea that managers do not react to equity shocks appears to be simply incor-
crect. A number of papers including Hovakimian, Opler and Titman (2001) show that
good equity returns are commonly followed by further equity issues. Frank and Goyal
(2004b) show that equity shocks induce offsetting debt market reactions. Strebulaev
(2004) points out that in an optimizing model managers should react to long term
changes, but not to every little blip in the market. Thus, the evidence for market con-
dition effects appears to be compatible with fairly conventional trade-off models with
varying leverage targets. The need for a completely new market timing theory as a
competitor to the conventional theories is, as yet, not established.\footnote{38}

**Stylized Fact 14** Market conditions have some effect on leverage decisions. The magnitude
and the durability of these effects is not a settled issue.

### 3.4 Market Valuation of Leverage Changes

#### 3.4.1 Predictions

When a firm issues, repurchases or exchanges one security for another, it changes its
capital structure. What are the valuation effects of these changes?

Under the trade-off theory firms will only take actions if they expect benefits. An
implication of the theory is that the market reaction to both equity and debt securities
will be positive. But the interpretation is not that easy. The market response to a lever-
age change confounds two pieces of information: the revelation of the fact that the
firm’s conditions have changed, necessitating financing, and the effect of the financ-
ing on security valuations. The information contained in security issuance decisions

\footnote{38It is worth observing that the proponents of "market timing theory", have not directly developed an
explicit model which might then be tested on other dimensions. A new theory is normally expected to
account for the facts that existing theories can already explain. So far the proponents of "market timing
theory" have not attempted to do so.}
could be either good news or bad news. It would be good news if the firm is issuing securities to take advantage of a promising new opportunity that was not previously anticipated. It might be bad news if the firm is issuing securities because the firm actually needs more resources than anticipated to conduct operations. A firm may also issue securities now in anticipation of a change in future needs. This implies that the trade-off theory by itself places no obvious restrictions on the market valuation effects of issuing decisions. Everything depends on the setting.

Jung et al. (1996) suggest an agency perspective and argue that equity issues by firms with poor growth prospects reflect agency problems between managers and shareholders. If this is the case, then stock prices would react negatively to news of equity issues.

The pecking order theory is usually interpreted as predicting that securities with more adverse selection (equity) will result in more negative market reaction. Securities with less adverse selection (debt) will result in less negative or no market reaction. This does of course, still rest on some assumptions about market anticipations.

3.4.2 Evidence

Announcements of ordinary debt issues generate zero market reaction on average (see Eckbo (1986) and Antweiler and Frank (2004)). The zero market reaction to corporate debt issues is robust to various attempts to control for partial anticipation. Announcements of convertible debt issues result in mildly negative stock price reactions (see Dann and Mikkelson (1984) and Mikkelson and Partch (1986)). Announcements of equity issues result in significant negative stock price reactions (see Asquith and Mullins (1986), Masulis and Korwar (1986), and Antweiler and Frank (2004)). The announcement effects are positive when common stock is repurchased (see Masulis, 1980b, Dann, 1981, and Antweiler and Frank, 2004). Equity issues by utilities generate less negative reactions than those by industrial issuers. Exchange of common for debt/preferred stock generates positive stock price reactions while exchange of debt/preferred for common stock generates negative reactions (Masulis, 1980a).

Summarizing the event study evidence, Eckbo and Masulis (1995) conclude that announcements of security issues typically generate a nonpositive stock price reaction. The valuation effects are the most negative for common stock issues, slightly less neg-
ative for convertible debt issues and least negative (zero) for straight debt issues. The effects are more negative the larger the issue.

**Stylized Fact 15** Announcements of corporate debt issues and debt repurchases have little if no effect on the market value of the firm.

**Stylized Fact 16** Announcements of equity issues are generally associated with a drop in the market value of the firm. Announcements of equity repurchases are generally associated with an increase in the market value of the firm.

The negative market reaction to equity issues and zero market reaction to debt issues is consistent with adverse selection arguments. Indeed, there are other interpretation. Jung et al. (1996) show that firms without valuable investment opportunities experience a more negative stock price reaction to equity issues than do firms with better investment opportunities. Thus, agency cost arguments could also explain the existing evidence on security issues. Further support for the agency view comes from the finding that firms without valuable investment opportunities issuing equity invest more than similar firms issuing debt and that firms with low managerial ownership have worse stock price reaction to new equity issue announcements than do firms with high managerial ownership.

The impact of equity issues appears to differ between countries. Several studies find positive market reaction to equity issues around the world (see Eckbo et al. 2005 for a summary). In order to understand this evidence Eckbo and Masulis (1992) and more recently Eckbo and Norli (2004) examine stock price reactions to equity issues conditional on a firm’s choice of flotation method. Firms can issue equity using uninsured rights, standby rights, firm commitment underwriting and private placements. The stock price reactions to equity issues depend on the floatation method. For U.S. firms Eckbo and Masulis (1992) find that the average announcement-period abnormal returns are insignificant for uninsured rights offerings and they are significantly negative for firm-commitment underwritten offerings. Eckbo and Norli (2004) study equity issuances on the Oslo Stock Exchange. They find that uninsured rights offerings and private placements result in positive stock price reactions while standby rights offerings generate negative market reactions. These papers interpret the effect of the flotation method as reflecting different degrees of adverse selection problems.
3.5 Natural Experiments

A problem with cross-sectional tests is that financial policy decisions are made jointly with investment and payout policy decisions. Thus, it is difficult to make causal inferences about debt ratios. A natural idea is thus to look for plausibly exogenous changes in a firm’s environment and then see how leverage responds. This method differs from studies of leverage changes because the defining criterion is a change in the firm’s environment. The literature contains a number of such studies.

Blanchard et al. (1994) examined a sample of 11 firms that received a large cash windfall without any change in marginal $q$. They find that firms increased their long-term debt following the cash windfall. The pecking order predicts an increase in debt if firms have attractive investment opportunities and borrow more money to undertake these projects. Since these firms did not have such opportunities, the increase in debt following cash windfalls is inconsistent with the pecking order theory.

The agency theories predict that managers expand when possible. Firms are able to increase debt because cash windfalls increase a firm’s debt capacity. The increase in long-term debt is therefore potentially consistent with the predictions of the agency theories.

It is often suggested that cash can be viewed as negative debt. Suppose that this is correct. Then, the cash windfall is a reduction in leverage. If the original leverage was optimal, then the firm needs to increase its debt (or repurchase equity) in response to the windfall. Thus, the behavior observed by Blanchard et al. (1994) seems quite compatible with the trade-off theory perspective. The fact that the adjustment takes place in the debt market rather than the equity market is consistent with the aggregate evidence of Frank and Goyal (2004b).

The Undistributed Profits Tax in 1936-1937 provides an interesting historical case to examine how exogenous shocks affect firms’ financing decisions. Christie and Nanda (1994) and Calomiris and Hubbard (1993) focus on the behavior of firms around the introduction of the tax on undistributed profits, which was introduced by the Roosevelt administration in 1936 but was abolished in 1938 among strong protests by businesses. Calomiris and Hubbard (1995) show that firms increased their debt after the introduction of the undistributed profits tax. This is consistent with firms increasing the amount of debt to reduce taxes on retained profits. They also show that the firms that
paid the highest taxes (and lowest dividends) had high debt ratios both before and after the introduction of the tax. These are small firms with arguably high costs of external financing.

In 1986, there was a tax reform that reduced both corporate and personal marginal tax rates. Givoly et al. (1992) studied this tax reform. They report that firms with high tax rates prior to the tax reform reduced their debt the most after the tax reform. On its own, this observation seems compatible with the trade-off theory because these are presumably the firms that receive the largest tax reductions. Graham (2003) suggests that this result is actually a bit surprising given the endogeneity bias of the tax rates and given the fact that the personal tax rate drops were not modelled in the analysis. This historical episode might be worth further research.

In 2003, there was a large cut in individual dividend income taxes. This event provides an alternative angle to consider the question of whether taxes affect the nature of corporate financing. In a model like those proposed by Stiglitz (1973) or Hennessy and Whited (2004), when such taxes are cut, more firms should find it attractive to pay dividends. Chetty and Saez (2004) show that there was a significant increase in dividend payments following the tax cut, along several dimensions as predicted in the tax-based theories.

Goyal et al. (2002) examine the US defense industry during the 1980-1995 period. Growth opportunities increased substantially for US weapons manufacturers during the Reagan defense buildup of the early 1980s and then declined significantly with the end of the cold war and the associated defense budget cuts in the late 1980s and the early 1990s. It seems quite unlikely that changes in corporate debt policies altered the US defense build up. Thus, it is reasonable to consider the response of firm leverage as reacting to the defense budgets rather than causing them.

Goyal et al. (2002) examine how the level and structure of corporate debt changed for a sample of defense firms relative to a benchmark sample over this period. As growth opportunities declined, weapons manufacturers, which were most affected by the decline in defense budgets, increased the level of debt in their capital structure. New debt issued increased significantly for weapons manufacturers during the low growth period. In addition, weapons manufacturers lengthened the maturity structure of their debt, decreased the ratio of private debt to total debt and decreased the use of
senior debt. Their evidence suggests that growth opportunities play a prominent role in corporate debt policies.

Baggs and Brander (2003) study the effect of the North American Free Trade Agreement on the leverage of Canadian firms. When domestic tariff protection is reduced, corporate profits decline at the affected firms and their leverage increases. When foreign tariffs decline profits tend to rise and leverage declines. The results are interesting but the interpretation is not simple. It is not clear whether the main force is the realized effect on profits, or the anticipated effect that operates through growth opportunities.

Dittmar (2004) and Mehrotra et al. (2003) examine the capital structure choices that firms make when engaging in spinoffs. These are interesting since in essence this is a point at which a capital structure must be selected. In most respects, firms allocate leverage based on attributes that have been shown to be important in cross-sectional studies. Thus, firms with higher tangibility of assets are allocated more leverage. Assets with lower liquidation costs have more leverage. Differences in leverage between the parent and the subsidiary are negatively related to variability in the industry’s operating income. However, in one respect, the results differ from cross-sectional evidence. Differences in leverage are positively related to differences in profitability.

Gilson (1997) examined the capital structures of firms emerging from financial distress. He argues that Chapter 11 bankruptcy helps firms overcome transaction costs and thus permits financially distressed firms to reduce leverage. This provides direct evidence that it may not be easy for a firm to restructure its finances outside of bankruptcy, even when the actual underlying business remains valuable. This is interesting evidence of the possible nature of the transaction costs associated with high debt levels.

Stylized Fact 17 The natural experiments papers are generally easy to understand from the perspective of the trade-off theory.

The above stylized fact does characterize the available studies. However, from the perspective of the trade-off theory perhaps the most important natural experiment was the introduction of the corporate income tax in 1909. It would be nice to know more than we currently do about how firms reacted. It would not be too surprising if that natural experiment proves difficult to interpret under either the pecking order or the trade-off theories.
3.6 Surveys

This section considers the evidence on capital structure theories which is based on a few recent surveys of corporate managers. While large sample studies offer cross-sectional variation and statistical power, they have the disadvantage that researchers can’t ask qualitative questions. Natural experiments and clinical studies provide excellent detail but typically use small samples. The survey approach provides a balance - it typically uses moderately large samples and has the ability to ask qualitative questions. Despite these benefits, survey approach remains rare in corporate finance.

The most common criticism of survey approach is that it measures beliefs rather than actions - the approach implicitly assumes that manager’s beliefs reflect reality. Different executives within a given firm might answer the same question in different ways. Perhaps more importantly, surveys rest on language. Ideas can be expressed in different words. In some instances the words sound attractive, while in other instances they sound unattractive. For instance is is hard to imagine any manager agreeing that he is employing a “cash burning signal.” Yet that same manager might agree that the reason a particular expensive action was worth while was that it proved to the market “how serious” the firm really is in some respect. As a result considerable care is needed if the survey is to truly measure what it intends to measure. Theorists may use language somewhat differently than do practitioners.

An important contribution to the recent survey approach is by Graham and Harvey (2001). The study, which presents responses from U.S. CFOs, reveals that firms value financial flexibility in making debt decisions. This desire for financial flexibility seems inconsistent with the pecking order theory since dividend-paying firms (firms with relatively less information asymmetry) value flexibility the most. Graham and Harvey also find that firms that perceive their stock to be undervalued are reluctant to issue equity. But they find that large and dividend-paying firms are more likely to delay equity issuance because of undervaluation. Again, these results are surprising from the perspective of the pecking order theory.

The survey evidence suggests that CFOs consider the tax advantages of debt to be moderately important. The tax advantages are more important for firms likely to be paying more taxes (large, regulated and dividend-paying firms). Managers show a

\[39\]References to earlier surveys can be found in Graham and Harvey (2001).
great deal of concern about credit ratings and earnings volatility in making debt decisions. In terms of whether firms have a target debt ratio, almost 44 percent of the CFOs responded that they have a tight or somewhat tight target capital structure. About 34 percent responded that they have a flexible target and only 19 percent responded that they have no target ratio.

Overall, the CFOs ranking of the top three factors affecting capital structure choice - financial flexibility, credit ratings, and earnings volatility - are consistent with the view that debt decisions are influenced by a desire to avoid getting the firm into distress. This does suggest a concern to avoid bankruptcy costs or financial distress costs. The terminology is sufficiently vague that this evidence is consistent with a wide range of possible sources of such costs.

Two other recent surveys of European managers confirm the findings of Graham and Harvey (2001). Both Bancel and Mittoo (2004) and Brounen et al. (2004) report that European managers also rank financial flexibility as the most important factor in determining their firm’s debt policy. In Europe, as in the U.S., some firms report having a target capital structure. But the target is flexible in most cases. Brounen et al find that the tax advantage of interest expense ranked as the fourth most important factor after financial flexibility, credit rating and earnings volatility.

Thus different surveys now seem to provide relatively similar rankings of factors. This is despite the fact that the firms are operating in countries with very different institutions. This is somewhat reassuring. The evidence is relatively hard to interpret in terms of the standard theories. Some of what is reported seems consistent with each theory, and some of what is reported seems inconsistent with each theory. The stress on financial flexibility is interesting, but potentially open to a variety of interpretations. In our view the survey evidence is of interest, but it is best regarded as being interesting and suggestive, rather than providing definitive tests.

4 Conclusions

According to the standard trade-off theory, taxes and bankruptcy account for the corporate use of debt. According to the standard pecking order theory, adverse selection accounts for the corporate use of debt. There are good reasons to question the standard
versions of both theories.

The trade-off theory focuses on taxes and bankruptcy costs. Until quite recently, this theory has had the honor of being the dominant theory in corporate finance textbooks; while, at the same time, the theory was in serious disrepute among most finance scholars. Recently that has changed somewhat. Some of the most prominent objections to the trade-off theory have become less compelling in light of more recent evidence and an improved understanding of some aspects of the dynamic environment.

The suggestions that firms use too little debt relative to the trade-off theory were asserted particularly forcefully by Miller (1977). However, a number of direct attempts to quantify Miller’s idea, such as Ju et al. (2004), find that the observed debt levels are not surprising when somewhat realistic structures and parameters are considered.

Similarly, many scholars, such as Myers (1984) and Fama and French (2002) regard the lack of a positive correlation between profits and debt as a problem for the trade-off theory. However, this objection too is compatible with fairly standard dynamic trade-off models as discussed in Section 2.3.2.

Despite the improved fortunes of the trade-off theory, it cannot be the full story. The U.S. corporate income tax did not begin until 1909 when it was introduced at a 1% rate. The use of debt contracts by businesses has a much longer history than does the corporate income tax. Thus, while taxes probably play an important role, there must be more to it.

The pecking order theory also has serious problems on a number of dimensions. Firms that have cash on hand actually issue debt. Frank and Goyal (2003) show that financing deficits does not wipe out the effect of the conventional factors. Firms routinely issue equity when they should not do so (Fama and French 2004, and Leary and Roberts, 2004a). As shown in Section 3.1 leverage is quite stationary over recent decades.

With the standard versions of both approaches having clear flaws, it is perhaps not surprising that there is active research underway\textsuperscript{40} We have a clear sense of the failings of the theories, but naturally there are differences of opinion on how best to

\textsuperscript{40}Since the standard version of both theories have serious weaknesses Fama and French (2003) have suggested that perhaps we should revert to the Modigliani-Miller theorem. However, that is not really credible either. There are far too many systematic patterns that hold up across countries and across time periods.
make progress.

There is a lot of evidence that seems consistent with bankruptcy affecting financing. The importance of collateral is quite strong in the data. A variety of other facts are also easy to interpret in this light. Direct transaction costs also seem to play a role. For instance the differences in use of debt and equity by small firms when compared to the use by large firms seems easy to understand in terms of direct transaction costs. The importance of retained earnings is quite consistent both with transaction costs playing a role or with taxes playing a role.

How important are the various agency conflicts relative to each other? Relative to adverse selection? Relative to taxes? We do not really know. A further problem is that currently there is little research that examines capital structure within a general equilibrium context. It would be nice to have calibrated versions of models along the lines of Auerbach and King (1983) or McDonald (2004). Ideally, the model might help provide an account of the kind of evidence presented in Tables 3 and 4. The remarkable growth in the role of financial intermediaries deserves much more attention than it has received in the literature on capital structure.

Many recent papers have focused on the dynamic aspects of leverage. This literature has already seriously altered our understanding of corporate capital structure. There is good reason to believe that this will continue to be a productive area of research over the next few years. Inclusion of agency conflicts and adverse selection in these dynamic models will undoubtedly prove interesting and will help close the gap between the approaches.

Where does this leave Myers’s (1984) contest? As one might have hoped, in the two decades since his address, that there have been significant improvements in our understanding of the theory and marked improvements in our knowledge of the facts. Perhaps the most serious problem at this time is the lack of a satisfactory unifying model. We are not aware of any current model that is capable of simultaneously accounting for the main stylized facts. It would be very nice to have such a model.

5 Appendix: The Stylized Facts

1. Over long periods of time, aggregate leverage is stationary.
2. Over the past half century, the aggregate market-based leverage ratio has been about 0.32. There have been surprisingly small fluctuations in this ratio from decade to decade.

3. At the aggregate level capital expenditures are very close to internal funds, although they are generally lower. This is true of large public firms and private firms. This is not true for small public firms.

4. At the aggregate level, the financing deficit is very close to debt issues. This also holds for large public firms and for private firms. This does not hold for small public firms. For small public firms the financing deficit very closely matches equity issues.

5. Aggregate dividends are very smooth and almost flat as a fraction of total assets for all classes of firms. There has been remarkable stability in the aggregate dividend rate over time. Large public firms pay higher dividends than do small public firms. Many small firms pay no dividends.

6. Over the past half century, there has been a large decrease in direct holding of corporate securities by households, and a corresponding huge increase in financial intermediation of such claims.

7. Households have been net suppliers of corporate equity since the 1960s. Corporations have been net buyers of equity since the 1980s. Most equity is no longer held directly. Insurance companies, mutual funds, and pension funds now hold more equity and debt than households hold directly.

8. There is a core set of seven reliable factors that are correlated with cross-sectional differences in leverage. Leverage is positively related to median industry leverage, collateral, log of assets, and expected inflation. Leverage is negatively related to market-to-book, profits, and a dummy variable for a firm paying dividends.

9. Firms adjust their debt frequently. The financing deficit plays a role in these decisions. The traditional cross-sectional factors are however more important than the financing deficit.
10. After an IPO, equity issues are more important for small firms than for large firms. Many large firms issue significant amounts of equity infrequently. But when they issue, the issues can be large. Many small firms issue equity fairly often.

11. Corporate leverage is mean-reverting at the firm level. The speed at which this happens is not a settled issue.

12. At the aggregate level, mean reversion in leverage mainly happens through debt market actions.

13. Mergers and acquisitions are more common reasons for exit than are bankruptcies and liquidations.

14. Market conditions have some effect on leverage decisions. The magnitude and the durability of these effects is not a settled issue.

15. Announcements of corporate debt issues and debt repurchases have little if any effect on the market value of the firm.

16. Announcements of equity issues are generally associated with a drop in the market value of the firm. Announcements of equity repurchases are generally associated with an increase in the market value of the firm.

17. The natural experiments papers are generally easy to understand from the perspective of the trade-off theory.

References


Caballero, R.J., and E. Engel, 2003, Adjustment is Much Slower than You Think, MIT Working paper.


Frank, M.Z. and V.K. Goyal, 2004a. Capital structure decisions: which factors are reliably important? Working paper, UBC and HKUST.


McDonald, R.L. 2004. Portfolio choice and corporate financial policy when there are tax-intermediating dealers, Northwestern University, Working paper.


Table 1

Common-size balance sheets

This table presents average balance sheets for the aggregate *U.S. Nonfarm Nonfinancial Corporate Business*. The data is constructed using the Federal Flow of Funds (March 2003 release). The value of each balance-sheet item is calculated as a percentage of the replacement value of total assets and then averaged over available years in each decade.

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tangible assets</td>
<td>0.78</td>
<td>0.77</td>
<td>0.74</td>
<td>0.73</td>
<td>0.68</td>
<td>0.58</td>
<td>0.49</td>
</tr>
<tr>
<td>Financial assets</td>
<td>0.22</td>
<td>0.23</td>
<td>0.26</td>
<td>0.27</td>
<td>0.32</td>
<td>0.42</td>
<td>0.51</td>
</tr>
<tr>
<td>Total assets</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Commercial paper</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Municipal securities</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Corporate bonds</td>
<td>0.08</td>
<td>0.09</td>
<td>0.10</td>
<td>0.10</td>
<td>0.08</td>
<td>0.12</td>
<td>0.13</td>
</tr>
<tr>
<td>Bank loans n.e.c.</td>
<td>0.04</td>
<td>0.04</td>
<td>0.06</td>
<td>0.06</td>
<td>0.05</td>
<td>0.05</td>
<td>0.04</td>
</tr>
<tr>
<td>Other loans/advances</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
<td>0.03</td>
<td>0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>Mortgages</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.04</td>
<td>0.03</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>Total debt</td>
<td>0.16</td>
<td>0.17</td>
<td>0.21</td>
<td>0.22</td>
<td>0.21</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>Trade payables</td>
<td>0.06</td>
<td>0.07</td>
<td>0.09</td>
<td>0.08</td>
<td>0.06</td>
<td>0.07</td>
<td>0.08</td>
</tr>
<tr>
<td>Taxes payable</td>
<td>0.03</td>
<td>0.03</td>
<td>0.02</td>
<td>0.01</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Misc. liabilities</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
<td>0.06</td>
<td>0.15</td>
<td>0.18</td>
<td>0.20</td>
</tr>
<tr>
<td>Liabilities</td>
<td>0.26</td>
<td>0.28</td>
<td>0.34</td>
<td>0.37</td>
<td>0.43</td>
<td>0.51</td>
<td>0.53</td>
</tr>
<tr>
<td>Net worth</td>
<td>0.74</td>
<td>0.72</td>
<td>0.66</td>
<td>0.63</td>
<td>0.57</td>
<td>0.49</td>
<td>0.47</td>
</tr>
<tr>
<td>Liabilities + net worth</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Debt/(Debt + Market value of equity) | 0.36 | 0.32 | 0.27 | 0.40 | 0.45 | 0.32 | 0.32 |
Table 2. Common-size statement of sources and use of funds

This table presents funds flow data *US Nonfarm Nonfinancial Corporate Business*. The value of each flow item is calculated as a percentage of the replacement value of total assets and then averaged over available years in each decade.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Profit before taxes</td>
<td>0.075</td>
<td>0.066</td>
<td>0.059</td>
<td>0.044</td>
<td>0.026</td>
<td>0.030</td>
<td>0.019</td>
</tr>
<tr>
<td>Taxes</td>
<td>0.028</td>
<td>0.032</td>
<td>0.026</td>
<td>0.017</td>
<td>0.010</td>
<td>0.011</td>
<td>0.007</td>
</tr>
<tr>
<td>Profit after taxes</td>
<td>0.047</td>
<td>0.034</td>
<td>0.033</td>
<td>0.026</td>
<td>0.016</td>
<td>0.020</td>
<td>0.012</td>
</tr>
<tr>
<td>Depreciation</td>
<td>0.020</td>
<td>0.027</td>
<td>0.037</td>
<td>0.033</td>
<td>0.039</td>
<td>0.039</td>
<td>0.038</td>
</tr>
<tr>
<td>Internal Funds-US op.</td>
<td>0.067</td>
<td>0.061</td>
<td>0.069</td>
<td>0.059</td>
<td>0.055</td>
<td>0.059</td>
<td>0.050</td>
</tr>
<tr>
<td>Foreign earnings ret. abd</td>
<td>0.001</td>
<td>0.001</td>
<td>0.002</td>
<td>0.003</td>
<td>0.003</td>
<td>0.005</td>
<td>0.006</td>
</tr>
<tr>
<td>Inventory valuation adj.</td>
<td>-0.009</td>
<td>-0.002</td>
<td>-0.001</td>
<td>-0.006</td>
<td>-0.002</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Net capital transfers</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Total internal funds</td>
<td>0.059</td>
<td>0.060</td>
<td>0.070</td>
<td>0.056</td>
<td>0.056</td>
<td>0.064</td>
<td>0.055</td>
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<tr>
<td>Dividends</td>
<td>0.015</td>
<td>0.014</td>
<td>0.015</td>
<td>0.010</td>
<td>0.009</td>
<td>0.014</td>
<td>0.014</td>
</tr>
<tr>
<td>Capital expenditures</td>
<td>0.050</td>
<td>0.050</td>
<td>0.058</td>
<td>0.055</td>
<td>0.050</td>
<td>0.051</td>
<td>0.045</td>
</tr>
<tr>
<td>Change in working capital</td>
<td>0.002</td>
<td>0.008</td>
<td>0.008</td>
<td>0.009</td>
<td>0.003</td>
<td>0.010</td>
<td>0.007</td>
</tr>
<tr>
<td>Discrepancy</td>
<td>0.009</td>
<td>0.004</td>
<td>0.008</td>
<td>0.006</td>
<td>0.008</td>
<td>-0.003</td>
<td>-0.003</td>
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<tr>
<td>Financing deficit</td>
<td>0.017</td>
<td>0.016</td>
<td>0.019</td>
<td>0.023</td>
<td>0.014</td>
<td>0.009</td>
<td>0.009</td>
</tr>
<tr>
<td>Net funds issued</td>
<td>0.017</td>
<td>0.016</td>
<td>0.019</td>
<td>0.023</td>
<td>0.014</td>
<td>0.009</td>
<td>0.009</td>
</tr>
<tr>
<td>Net equity issues</td>
<td>0.003</td>
<td>0.003</td>
<td>0.001</td>
<td>0.003</td>
<td>-0.007</td>
<td>-0.004</td>
<td>-0.004</td>
</tr>
<tr>
<td>Net debt issues</td>
<td>0.014</td>
<td>0.012</td>
<td>0.017</td>
<td>0.021</td>
<td>0.021</td>
<td>0.013</td>
<td>0.012</td>
</tr>
</tbody>
</table>

*Sources of debt financing*

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>Commercial paper issues</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.001</td>
<td>0.001</td>
<td>0.001</td>
<td>-0.002</td>
</tr>
<tr>
<td>Municipal securities</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.001</td>
<td>0.001</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Corporate bonds issues</td>
<td>0.007</td>
<td>0.006</td>
<td>0.007</td>
<td>0.008</td>
<td>0.008</td>
<td>0.009</td>
<td>0.011</td>
</tr>
<tr>
<td>Bank loans increase</td>
<td>0.004</td>
<td>0.004</td>
<td>0.006</td>
<td>0.005</td>
<td>0.005</td>
<td>0.002</td>
<td>-0.001</td>
</tr>
<tr>
<td>Other loans increase</td>
<td>0.000</td>
<td>0.001</td>
<td>0.002</td>
<td>0.003</td>
<td>0.004</td>
<td>0.001</td>
<td>0.002</td>
</tr>
<tr>
<td>Mortgages issued</td>
<td>0.002</td>
<td>0.001</td>
<td>0.002</td>
<td>0.004</td>
<td>0.001</td>
<td>0.000</td>
<td>0.002</td>
</tr>
</tbody>
</table>
Table 3 Levels of Securities Outstanding by Sector.

This table presents aggregate debt and equity issued and held by different sectors of the economy. Bonds issued and held are reported as a fraction of total bonds outstanding. Equity issued and held is reported as a fraction of total equity outstanding.

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td><strong>Bond Issued by</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corporate</td>
<td>0.896</td>
<td>0.884</td>
<td>0.809</td>
<td>0.762</td>
<td>0.665</td>
<td>0.501</td>
<td>0.443</td>
</tr>
<tr>
<td>Rest of World</td>
<td>0.091</td>
<td>0.061</td>
<td>0.071</td>
<td>0.080</td>
<td>0.083</td>
<td>0.095</td>
<td>0.087</td>
</tr>
<tr>
<td>Financial firms</td>
<td>0.014</td>
<td>0.055</td>
<td>0.120</td>
<td>0.158</td>
<td>0.253</td>
<td>0.403</td>
<td>0.470</td>
</tr>
<tr>
<td><strong>Bond Holdings by</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Households</td>
<td>0.229</td>
<td>0.107</td>
<td>0.102</td>
<td>0.153</td>
<td>0.070</td>
<td>0.145</td>
<td>0.137</td>
</tr>
<tr>
<td>Government</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.005</td>
<td>0.013</td>
<td>0.015</td>
</tr>
<tr>
<td>Rest of World</td>
<td>0.010</td>
<td>0.007</td>
<td>0.008</td>
<td>0.026</td>
<td>0.123</td>
<td>0.132</td>
<td>0.196</td>
</tr>
<tr>
<td>Banks</td>
<td>0.126</td>
<td>0.085</td>
<td>0.048</td>
<td>0.109</td>
<td>0.121</td>
<td>0.087</td>
<td>0.085</td>
</tr>
<tr>
<td>Insurance firms</td>
<td>0.610</td>
<td>0.774</td>
<td>0.807</td>
<td>0.683</td>
<td>0.632</td>
<td>0.502</td>
<td>0.396</td>
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<tr>
<td>Funds</td>
<td>0.026</td>
<td>0.027</td>
<td>0.034</td>
<td>0.030</td>
<td>0.048</td>
<td>0.122</td>
<td>0.172</td>
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<tr>
<td><strong>Equity Issued by</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corporate</td>
<td>0.885</td>
<td>0.876</td>
<td>0.845</td>
<td>0.876</td>
<td>0.860</td>
<td>0.775</td>
<td>0.698</td>
</tr>
<tr>
<td>Rest of World</td>
<td>0.008</td>
<td>0.008</td>
<td>0.008</td>
<td>0.010</td>
<td>0.024</td>
<td>0.083</td>
<td>0.106</td>
</tr>
<tr>
<td>Financial firms</td>
<td>0.107</td>
<td>0.116</td>
<td>0.147</td>
<td>0.114</td>
<td>0.116</td>
<td>0.141</td>
<td>0.196</td>
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<tr>
<td><strong>Equity Holdings by</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Households</td>
<td>0.917</td>
<td>0.885</td>
<td>0.824</td>
<td>0.615</td>
<td>0.514</td>
<td>0.490</td>
<td>0.392</td>
</tr>
<tr>
<td>Government</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.003</td>
<td>0.008</td>
</tr>
<tr>
<td>Rest of World</td>
<td>0.023</td>
<td>0.022</td>
<td>0.024</td>
<td>0.037</td>
<td>0.062</td>
<td>0.068</td>
<td>0.103</td>
</tr>
<tr>
<td>Banks</td>
<td>0.002</td>
<td>0.003</td>
<td>0.014</td>
<td>0.112</td>
<td>0.076</td>
<td>0.034</td>
<td>0.021</td>
</tr>
<tr>
<td>Insurance firms</td>
<td>0.032</td>
<td>0.052</td>
<td>0.087</td>
<td>0.188</td>
<td>0.293</td>
<td>0.280</td>
<td>0.277</td>
</tr>
<tr>
<td>Funds</td>
<td>0.027</td>
<td>0.039</td>
<td>0.051</td>
<td>0.048</td>
<td>0.055</td>
<td>0.124</td>
<td>0.199</td>
</tr>
<tr>
<td>Loans to Corporate/Total bank loans</td>
<td>0.747</td>
<td>0.674</td>
<td>0.632</td>
<td>0.563</td>
<td>0.614</td>
<td>0.621</td>
<td>0.575</td>
</tr>
</tbody>
</table>
Table 4 Flows of Securities by Sector.

Bond issues and purchases are divided by lagged bonds outstanding. Equity issues and purchases are divided by lagged equity outstanding.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Bond Issuance/Total bonds outstanding</strong></td>
<td>0.096</td>
<td>0.081</td>
<td>0.079</td>
<td>0.101</td>
<td>0.127</td>
<td>0.114</td>
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<tr>
<td><strong>Bonds Issued by Corporates</strong></td>
<td>0.090</td>
<td>0.068</td>
<td>0.059</td>
<td>0.068</td>
<td>0.074</td>
<td>0.040</td>
<td>0.042</td>
</tr>
<tr>
<td><strong>Corporates</strong></td>
<td>0.090</td>
<td>0.068</td>
<td>0.059</td>
<td>0.068</td>
<td>0.074</td>
<td>0.040</td>
<td>0.042</td>
</tr>
<tr>
<td><strong>Rest of World</strong></td>
<td>0.000</td>
<td>0.004</td>
<td>0.007</td>
<td>0.011</td>
<td>0.006</td>
<td>0.016</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Financial firms</strong></td>
<td>0.007</td>
<td>0.010</td>
<td>0.013</td>
<td>0.022</td>
<td>0.046</td>
<td>0.059</td>
<td>0.060</td>
</tr>
<tr>
<td><strong>Bonds Purchased by Households</strong></td>
<td>-0.018</td>
<td>0.001</td>
<td>0.013</td>
<td>0.017</td>
<td>0.005</td>
<td>0.024</td>
<td>0.006</td>
</tr>
<tr>
<td><strong>Government</strong></td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.002</td>
<td>0.002</td>
<td>0.001</td>
</tr>
<tr>
<td><strong>Rest of World</strong></td>
<td>-0.001</td>
<td>0.000</td>
<td>0.001</td>
<td>0.003</td>
<td>0.024</td>
<td>0.018</td>
<td>0.036</td>
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<tr>
<td><strong>Banks</strong></td>
<td>0.009</td>
<td>0.001</td>
<td>0.003</td>
<td>0.013</td>
<td>0.018</td>
<td>0.005</td>
<td>0.009</td>
</tr>
<tr>
<td><strong>Insurance firms</strong></td>
<td>0.106</td>
<td>0.077</td>
<td>0.059</td>
<td>0.065</td>
<td>0.067</td>
<td>0.042</td>
<td>0.028</td>
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<tr>
<td><strong>Funds</strong></td>
<td>0.000</td>
<td>0.002</td>
<td>0.003</td>
<td>0.002</td>
<td>0.011</td>
<td>0.024</td>
<td>0.023</td>
</tr>
<tr>
<td><strong>Total Equity Issuance/Total equity outstanding</strong></td>
<td>0.012</td>
<td>0.012</td>
<td>0.004</td>
<td>0.009</td>
<td>-0.018</td>
<td>0.004</td>
<td>0.003</td>
</tr>
<tr>
<td><strong>Equity Issues by Corporates</strong></td>
<td>0.010</td>
<td>0.010</td>
<td>0.002</td>
<td>0.006</td>
<td>-0.023</td>
<td>-0.005</td>
<td>-0.004</td>
</tr>
<tr>
<td><strong>Corporates</strong></td>
<td>0.010</td>
<td>0.010</td>
<td>0.002</td>
<td>0.006</td>
<td>-0.023</td>
<td>-0.005</td>
<td>-0.004</td>
</tr>
<tr>
<td><strong>Rest of World</strong></td>
<td>0.000</td>
<td>0.001</td>
<td>0.002</td>
<td>0.000</td>
<td>0.001</td>
<td>0.008</td>
<td>0.004</td>
</tr>
<tr>
<td><strong>Financial firms</strong></td>
<td>0.002</td>
<td>0.002</td>
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<td>0.002</td>
<td>0.004</td>
<td>0.002</td>
<td>0.003</td>
</tr>
<tr>
<td><strong>Equity Purchased by Households</strong></td>
<td>0.007</td>
<td>0.003</td>
<td>-0.007</td>
<td>-0.007</td>
<td>-0.034</td>
<td>-0.017</td>
<td>-0.015</td>
</tr>
<tr>
<td><strong>Government</strong></td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td><strong>Rest of World</strong></td>
<td>-0.001</td>
<td>0.001</td>
<td>0.001</td>
<td>0.002</td>
<td>0.003</td>
<td>0.002</td>
<td>0.007</td>
</tr>
<tr>
<td><strong>Banks</strong></td>
<td>0.000</td>
<td>0.000</td>
<td>0.001</td>
<td>0.000</td>
<td>-0.004</td>
<td>-0.003</td>
<td>-0.001</td>
</tr>
<tr>
<td><strong>Insurance firms</strong></td>
<td>0.003</td>
<td>0.005</td>
<td>0.007</td>
<td>0.016</td>
<td>0.014</td>
<td>0.006</td>
<td>0.002</td>
</tr>
<tr>
<td><strong>Funds</strong></td>
<td>0.003</td>
<td>0.002</td>
<td>0.002</td>
<td>-0.002</td>
<td>0.003</td>
<td>0.014</td>
<td>0.009</td>
</tr>
</tbody>
</table>
Table 5. Leverage Transition Rates

Leverage transition tables for the untrimmed market leverage ratios (D) for the period 1950-2000. The data are from the Compustat files. Market leverage is defined as the ratio of book value of debt divided by book debt plus market value of equity. The row number is the group that the firm leverage belongs to in year t. The column number is the group that the firm’s leverage belongs to in year t+1. The cell entries measure percentages. Exit is defined as not a missing value in year t, but a missing value in year t+1. Due to the lagging involved, the numbers for exit exclude the last two years.

<table>
<thead>
<tr>
<th></th>
<th>D &lt;= 0</th>
<th>0 &lt; D &lt;= 0.1</th>
<th>0.1 &lt; D &lt;= 0.2</th>
<th>0.2 &lt; D &lt;= 0.3</th>
<th>0.3 &lt; D &lt;= 0.4</th>
<th>0.4 &lt; D &lt;= 0.5</th>
<th>0.5 &lt; D &lt;= 0.6</th>
<th>0.6 &lt; D &lt;= 0.7</th>
<th>0.7 &lt; D &lt;= 0.8</th>
<th>0.8 &lt; D &lt;= 0.9</th>
<th>D &gt; 0.9</th>
<th>Exit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>D &lt;= 0</td>
<td>71.1</td>
<td>14.7</td>
<td>4.2</td>
<td>2.0</td>
<td>0.9</td>
<td>0.6</td>
<td>0.4</td>
<td>0.3</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>5.7</td>
<td>100.0</td>
</tr>
<tr>
<td>0 &lt; D &lt;= 0.1</td>
<td>6.8</td>
<td>64.7</td>
<td>14.3</td>
<td>5.0</td>
<td>2.1</td>
<td>1.0</td>
<td>0.5</td>
<td>0.3</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>5.2</td>
<td>100.0</td>
</tr>
<tr>
<td>0.1 &lt; D &lt;= 0.2</td>
<td>1.6</td>
<td>20.1</td>
<td>39.9</td>
<td>19.4</td>
<td>7.8</td>
<td>3.4</td>
<td>1.5</td>
<td>0.7</td>
<td>0.3</td>
<td>0.1</td>
<td>0.0</td>
<td>5.3</td>
<td>100.0</td>
</tr>
<tr>
<td>0.2 &lt; D &lt;= 0.3</td>
<td>0.7</td>
<td>5.4</td>
<td>21.1</td>
<td>33.2</td>
<td>18.8</td>
<td>8.5</td>
<td>3.8</td>
<td>1.7</td>
<td>0.8</td>
<td>0.2</td>
<td>0.1</td>
<td>5.9</td>
<td>100.0</td>
</tr>
<tr>
<td>0.3 &lt; D &lt;= 0.4</td>
<td>0.5</td>
<td>2.3</td>
<td>7.8</td>
<td>20.7</td>
<td>30.4</td>
<td>18.3</td>
<td>8.4</td>
<td>3.5</td>
<td>1.4</td>
<td>0.4</td>
<td>0.1</td>
<td>6.3</td>
<td>100.0</td>
</tr>
<tr>
<td>0.4 &lt; D &lt;= 0.5</td>
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<td>1.1</td>
<td>3.0</td>
<td>8.5</td>
<td>20.4</td>
<td>29.6</td>
<td>18.4</td>
<td>7.8</td>
<td>3.4</td>
<td>1.1</td>
<td>0.3</td>
<td>6.1</td>
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<tr>
<td>0.5 &lt; D &lt;= 0.6</td>
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<td>0.7</td>
<td>1.6</td>
<td>3.6</td>
<td>9.1</td>
<td>20.2</td>
<td>28.8</td>
<td>18.0</td>
<td>7.2</td>
<td>2.7</td>
<td>0.5</td>
<td>7.4</td>
<td>100.0</td>
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<tr>
<td>0.6 &lt; D &lt;= 0.7</td>
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<td>0.6</td>
<td>0.9</td>
<td>1.9</td>
<td>4.3</td>
<td>9.5</td>
<td>21.2</td>
<td>28.9</td>
<td>17.2</td>
<td>6.1</td>
<td>1.4</td>
<td>7.9</td>
<td>100.0</td>
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<tr>
<td>0.7 &lt; D &lt;= 0.8</td>
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<td>0.5</td>
<td>0.6</td>
<td>1.0</td>
<td>2.2</td>
<td>4.5</td>
<td>10.3</td>
<td>21.4</td>
<td>29.5</td>
<td>16.1</td>
<td>4.0</td>
<td>9.6</td>
<td>100.0</td>
</tr>
<tr>
<td>0.8 &lt; D &lt;= 0.9</td>
<td>0.8</td>
<td>0.6</td>
<td>0.5</td>
<td>0.8</td>
<td>1.4</td>
<td>2.3</td>
<td>4.3</td>
<td>9.8</td>
<td>21.0</td>
<td>31.4</td>
<td>15.0</td>
<td>12.3</td>
<td>100.0</td>
</tr>
<tr>
<td>D &gt; 0.9</td>
<td>1.2</td>
<td>0.9</td>
<td>0.3</td>
<td>0.8</td>
<td>0.9</td>
<td>1.2</td>
<td>1.9</td>
<td>3.7</td>
<td>7.5</td>
<td>23.1</td>
<td>42.6</td>
<td>16.0</td>
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</tr>
<tr>
<td>Total</td>
<td>9.3</td>
<td>20.2</td>
<td>13.2</td>
<td>11.6</td>
<td>10.1</td>
<td>8.8</td>
<td>7.3</td>
<td>5.6</td>
<td>3.9</td>
<td>2.4</td>
<td>1.2</td>
<td>6.4</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Table 6: Distribution of Compustat Deletion Codes

The table provides a distribution of Compustat deletion codes for the period 1950-2000. Companies can exit in various ways. Compustat footnote 35 provides some evidence on the relative importance of alternative exit mechanism. This footnote appears to be somewhat incomplete, and so should be regarded as suggestive rather than definitive. Frequency gives the raw count of the number of times the particular reason for deletion was listed. Fraction gives each reason divided by the total.

<table>
<thead>
<tr>
<th>Reason for deletion</th>
<th>Frequency</th>
<th>Fraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisition or Merger</td>
<td>3,176</td>
<td>0.589</td>
</tr>
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<td>Bankruptcy-Chapter 11</td>
<td>368</td>
<td>0.068</td>
</tr>
<tr>
<td>Liquidation-Chapter 7</td>
<td>186</td>
<td>0.035</td>
</tr>
<tr>
<td>Reverse acquisition (from 1983 onwards)</td>
<td>50</td>
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</tr>
<tr>
<td>No longer fits original file format (from 1978 onwards)</td>
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<td>0.005</td>
</tr>
<tr>
<td>Leveraged buyout</td>
<td>91</td>
<td>0.017</td>
</tr>
<tr>
<td>Now a private company</td>
<td>320</td>
<td>0.059</td>
</tr>
<tr>
<td>Other (no longer files with SEC etc)</td>
<td>1,170</td>
<td>0.217</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,389</strong></td>
<td><strong>1.000</strong></td>
</tr>
</tbody>
</table>
Figure 1: Aggregate Federal Flow of Funds Data

Aggregate data from Funds Flow Statements (March 2003) release is used to construct capital expenditure to assets, internal funds to assets, dividend to assets, deficit to assets, net equity issued to assets, and net debt issued to assets, 1945 to 2002. The data is for the nonfarm nonfinancial corporate sector of the US economy. The deficit is calculated as cash dividends plus investments plus change in working capital plus discrepancy minus internal funds.
Figure 2: Large Public Firms from Compustat

Average capital expenditure to assets, internal funds to assets, dividend to assets, deficit to assets, net equity issued to assets, and net debt issued to assets, 1971 to 2002. The sample comprises large publicly traded US firms on the Compustat files (in the top one-third by book assets each year). Financial firms and regulated utilities are excluded. The deficit is calculated as cash dividends plus investments plus change in working capital minus internal cash flow. Net debt issued is long-term debt issuance minus long-term debt redemption. Net equity issued is the issue of stock minus the repurchase of stock. The variables are constructed using data from Compustat funds-flow statements.
Figure 3: Small Public Firms from Compustat

Average capital expenditure to assets, internal funds to assets, dividend to assets, deficit to assets, net equity issued to assets, and net debt issued to assets, 1971 to 2002. The sample comprises small publicly traded US firms on the Compustat files (in the bottom one-third by book assets each year). Financial firms and regulated utilities are excluded. The deficit is calculated as cash dividends plus investments plus change in working capital minus internal cash flow. Net debt issued is long-term debt issuance minus long-term debt redemption. Net equity issued is the issue of stock minus the repurchase of stock. The variables are constructed using data from Compustat funds-flow statements.
Private sector series is the difference series between aggregate values for the nonfarm nonfinancial corporate sector for the US economy from the Funds Flow statements and nonfarm nonfinancial publicly traded sample from the Compustat. The difference series is used to compute capital expenditure to assets, internal funds to assets, dividend to assets, deficit to assets, net equity issued to assets, and net debt issued to assets, 1971 to 2002.