DEBT vs. EQUITY AND ASYMMETRIC INFORMATION:

A REVIEW

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Abstract: Recent Nobel Prizes to Akerlof, Spence, and Stiglitz motivate this review of basic concepts and empirical evidence on information asymmetry and the choice of debt vs. equity. We first review the literature that holds investment fixed. Then we review capital structure issues related to the adverse investment selection problem of Myers-Majluf. Finally, we discuss the timing hypothesis of capital structure. Empirical studies do not consistently support one theory of capital structure under information asymmetry over the others. Thus, the review suggests that additional theoretical contributions are needed to help understand and explain findings in the empirical literature.

Keywords: capital structure, asymmetric information, pecking order hypothesis, timing hypothesis

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Debt vs. Equity and Asymmetric Information: A Review

1. Introduction

George Akerlof, Michael Spence, and Joseph Stiglitz received the 2001 Nobel Prize for introducing an enduring set of tools to examine the economic impact of asymmetric information. The tools have been used to open vast research agendas in many areas of economics, including corporate finance.

In corporate finance, asymmetric information refers to the notion that firm insiders, typically the managers, have better information than do market participants on the value of their firm's assets and investment opportunities. This asymmetry creates the possibility that the market will not price the firm's claims correctly, thus providing a positive role for corporate financing decisions.

In this paper we review the impact of asymmetric information on one specific area of corporate finance, the choice of capital structure claims in terms of debt versus equity. As Riley (2001) notes in his general review, capital structure is a topic that has been dramatically affected by the rigorous consideration of information asymmetry. As one part of a comprehensive review of (nontax-driven) capital structure theories, Harris and Raviv (1991) discuss the most important developments in asymmetric information and capital structure, observing that up to that time theoretical research on the topic had reached a point of diminishing returns. However, there has been considerable research in this area since then, especially on the empirical side. We revisit and update the topic in this article. We do not review asymmetric information topics other than

those related to the basic choice between debt and equity, nor do we review capital structure topics other than those related directly to asymmetric information.

Our review updates the discussion of the choice of debt versus equity in an asymmetric information environment by using a broad overview of the theory and empirical results. We summarize the theoretical contributions. Our review of the empirical literature is generally limited to a summary of the main results and their interpretations. Rather than attempting to include all the relevant work, we discuss a representative sampling that can provide an understanding of recent developments in this area.

Our review is organized as follows. In Section 2, we summarize the groundwork laid by the 2001 Nobel laureates. In Section 3 we first summarize the Ross (1977) model illustrating how mispriced equity gives managers the incentive to signal the market their private information through capital structure decisions. We then touch on the main ideas contained in other capital structure signaling models in which investment is fixed. We also review some of the empirical findings related to these models. Section 4 extends the connection between signaling and leverage by examining the pecking order model in Myers and Majluf (1984). They endogenize the firm's investment decision and demonstrate that managers, acting in shareholders' best interests may pass up positive net present value (NPV) investments if the equity necessary to finance them is sufficiently underpriced by the market. We then discuss subsequent theoretical models of firms' financing and investing decisions, and the implication for the choice between debt and equity. We also review some of the empirical tests related to the pecking order hypothesis. Section 5 reviews the theory and evidence on the timing hypothesis of capital structure choice. Section 6 summarizes and concludes the review.

2. Foundations of capital structure and asymmetric information

Modigliani and Miller (1958) establish the foundation of capital structure theory and demonstrate that in a world of fully informed investors, no taxes, and risk-free debt, firm value – and in particular, equity value – is determined without regard to the firm's capital structure. They are rightly credited for this irrelevance result, but the term "irrelevant" does not appear in the 1958 article in the context of financing decisions. To the contrary, Modigliani and Miller identify where relevance might be found in capital structure decisions by looking at market frictions, including the potential impact of asymmetric information:

> That grounds for preferring one type of financial structure to another will still exist within the framework of our model can readily be seen for the case of common stock financing. In general, except for something like a widely publicized oil-strike, we would expect the market to place very heavy weight on current and recent past earnings in forming expectations as to future returns. Hence if the owners of a firm discovered a major investment opportunity which they felt would yield much more than [the cost of capital], they might well prefer not to finance it via common stock at the then ruling price, because this price may fail to capitalize the new venture. (p.292)

Thus, Modigliani and Miller argue that asymmetric information makes retained earnings and debt better financing tools than new equity when the equity is underpriced. They do not discuss the potential implications of bankruptcy in their asymmetric information scenario, but the intuition appears straightforward. In the presence of bankruptcy costs, there is a limit to how much risky debt can be issued before new equity is preferred to issuing any more risky debt. The larger a project's unrecognized NPV, the higher will be that limit, all else equal. Firms with a higher level of unrecognized NPV will have more incentive to issue debt rather than new equity.

Unlike Ross (1977), Myers and Majluf (1984), and others that followed, Modigliani and Miller did not have the asymmetric information theory developed by the Nobel laureates of 2001. Thus, Modigliani and Miller do not suggest that managers signal their information through financing decisions, or that asymmetric information might prevent managers from accepting

positive NPV projects. [Stiglitz (1969, 1974), in his generalization of the Modigliani and Miller theory, appears to be the first to note that financial policies may convey information on firms' prospects.]

Asymmetric information theory, pioneered by the 2001 Nobel laureates, introduced the concept of adverse selection. When contracting with an agent with superior information, an uninformed agent faces the consequences of adverse selection because he does not know if the relevant characteristics of the informed agent are good or bad. To demonstrate the adverse selection problem, and how signaling can resolve it, Akerlof (1970) used the "lemons" market for used cars to illustrate how sellers of good quality cars can use a warranty to signal quality to buyers who cannot otherwise distinguish between good cars and lemons. Absent a means for buyers to distinguish the quality of a used car, the equilibrium used car price will be the expected value of a used car. This is a pooling equilibrium, because the average price is paid for cars of varying quality (value) that are indistinguishable. In a pooling equilibrium, sellers of lemons are big winners, sellers of good cars are big losers, and buyers are indifferent. Thus, the cost created by the information asymmetry is borne entirely by the good quality car sellers.

Clearly, the seller of a good quality car would benefit by conveying, or signaling, the car's quality to buyers. The owner of a lemon will also wish to represent the quality of his car as good. Therefore, the signal must be credible if it is to be capable of allowing buyers to identify a used car's quality. In game-theoretic terminology a credible signal is incentive compatible. In other words, a credible signal is one that the owner of a lemon has no incentive to attempt to mimic. To credibly signal quality, the seller of a good quality car can offer a warranty.

There are two conditions that the warranty must satisfy to create a separating equilibrium, in which buyers pay a higher price for a higher quality used car. The first condition is incentive

compatibility: the lemon owner must not have the incentive to offer the same warranty as the owner of a good car. The second condition is individual rationality, which ensures that the seller of a good quality car is in fact better off in the separating equilibrium than in the pooling equilibrium. In the used car market, a warranty is a credible signal of quality because a sufficiently large warranty is too expensive to be attractive to sellers of lemons, because they are more likely to have to pay the warranty.

In this type of asymmetric information model the informed agent moves first, and the separating equilibrium is more commonly known as a signaling equilibrium. The term separating equilibrium is generally used in models in which the uninformed agent moves first by offering a menu of incentive compatible choices (contracts) from which the informed self-select, revealing their private information through their choice. As an example, compare the analysis of a signaling equilibrium in Akerlof or Spence (1973) with that of the separating equilibrium in Rothschild and Stiglitz (1976).

3. Leverage signaling with investment fixed

3.1. The Ross model

In the Ross (1977) model, we see the intuition of Akerlof (1970) as it applies to capital structure. Ross illustrates that managers with an informational advantage have an incentive to signal their private information through their choice of debt level. Firms with lower expected cash flows find it more costly to incur higher levels of debt (because bankruptcy is more likely) than do firms with higher expected cash flows. Just as sellers of lemons find a large warranty too costly, managers of firms with low expected cash flows find a relatively high level of debt too costly because it imposes a high probability of bankruptcy. Thus, high-valued firms can signal this information to the market by issuing a sufficiently high amount of debt.

To see how the Ross signaling model works, assume there are two firms, good (*G*) and bad (*B*). During the next period, firms realize a cash flow $\tilde{x}$, where the density function $f^t(x)$ is uniform on the interval $[0, x^t]$, $t = G, B$. The cash flow distributions are ordered by first-order stochastic dominance $(x^G > x^B)$. The market knows the distributions of cash flows, but cannot distinguish firm *G* from firm *B* because the firms are identical in all other respects. By pooling firms, the market undervalues the good firm and overvalues the bad firm, so the good firm would like to convey its quality to the market. Conversely, the bad firm would prefer to hide amidst the uncertainty.

One key difference between the Ross signaling model and Akerlof's is the objective function. In the example of the used car market, the sellers' objective is to maximize their profits. The objective function that Ross uses is the manager's wage. Ross assumes this wage has two components. One is a function of firm value, and the other is a bankruptcy penalty. This penalty is a cost the manager incurs (separate from any bankruptcy costs the firm may incur) if the firm goes bankrupt. The manager's objective is to choose the firm's level of debt, *D*, to maximize his wage.

Suppose that managers have the following wage contract:

$$W^t = \alpha V_0(D^t) - L\int_0^{D^t} f^t(x)dx. \tag{1}$$

The first term is a positive scalar times the current market value of the firm, $V_0(D^t)$, which is a function of the face value of debt, D^t, that the firm *t* issues. This term reflects the fact that the market uses the firm's debt level as a signal of firm value, which is the same as used car buyers using the seller's warranty as a signal of car quality. The second term is the bankruptcy penalty, *L*, times the likelihood of bankruptcy, $F^t(D^t)$. The incentive compatibility condition requires

$$\alpha V_0(D^G) - L\int_0^{D^G} f^B(x)dx \quad \leq \quad \alpha V_0(D^B) - L\int_0^{D^B} f^B(x)dx\,. \tag{2}$$

The left-hand side of this condition is manager *B's* wage if he chooses D^G, the debt level chosen by manager *G*. The right-hand side is his wage if he chooses not to mimic. Because debt is personally costly to managers, in a separating equilibrium $D^G = D^*$ will be the lowest debt level sufficient to satisfy incentive compatibility. Also, $D^B = 0$ because any debt level above this, but strictly less than D^*, imposes a cost on the *B* manager while still revealing his firm's type to the market. Finally, in a separating equilibrium, the market correctly identifies and thus correctly values, the firms. We can rearrange the incentive compatibility condition and make some substitutions to interpret the requirement for D^*:

$$L\int_0^{D^*} f^B(x)dx \quad \geq \quad \alpha[V_0(D^*) - V_0(0)] \tag{3}$$

$$LF^B(D^*) \quad \geq \quad \alpha\left(\frac{x_G - x_B}{2}\right) \tag{4}$$

The last condition tells us that if D^* is set so that firm *B* manager's expected bankruptcy penalty from financing with D^* outweighs the gain in wage from being perceived as firm *G*, then incentive compatibility results.

3.2. Other leverage signaling models

Another fundamental signaling model is that of Leland and Pyle (1977), in which insider ownership provides the signal of firm quality. Under certain conditions, managers of high-quality firms signal their type by retaining a high proportion of ownership, and therefore finance with higher levels of debt than managers of low-quality firms. Financing with debt allows a manager to retain a larger ownership stake in the firm, but the larger equity stake is costly to a risk-averse manager. The fact that a larger equity stake is less costly to a manager of a high-quality firm

drives the incentive compatibility of the signal. As in Ross (1977), the Leland and Pyle model predicts a positive correlation between firm quality and leverage.

Heinkel (1982) devises a model of debt signaling in which the information asymmetry is about both the mean and the variance of returns. The assumed (positive) relations between mean and variance drives a signaling equilibrium in which higher-value firms signal their quality with higher debt levels. The Heinkel assumption, that more-valuable firms are also more risky, is consistent with the Ross result that more-valuable firms have a higher likelihood of default. This key assumption allows for a costless signaling equilibrium in which riskier, more-valuable firms have higher levels of debt financing.[1] This positive correlation between firm value and leverage is the same result found by Ross, but Heinkel does not assume that managers face a bankruptcy penalty. Instead, managers own the firm and they make capital structure decisions to maximize the value of their claim. In a pooling equilibrium, high-value, high-risk firms (low-quality firms in Heinkel's model) find their equity undervalued and their debt overvalued, but low-value, low-risk firms (high-quality firms) have the opposite misvaluations. Thus, the high-value firms are attracted to the debt market and the low-value firms are attracted to the equity market. In this model, the incentive compatibility that is necessary for separation must run both ways. A low-value firm will not find it to desirable to mimic a high-value firm because that would require issuing more undervalued debt and less overvalued equity. Similarly, a high-value firm would not mimic a low-value firm because that would require issuing more undervalued equity and less overvalued debt. The signaling is costless because the manager/owner's utility is derived entirely

[1] This assumption is not necessary for the separating equilibrium in Heinkel, but it is necessary for a costless separating equilibrium. If firm value and credit risk were negatively correlated, as in Ross, a separating equilibrium may exist provided both the incentive compatibility and individual rationality conditions are met.

from the firm's equity value and debt is assumed to carry no financial distress or bankruptcy costs.

The information asymmetry in the Blazenko (1987), John (1987), and Ravid and Sarig (1991) models concerns only the mean return. Blazenko shows that if managers are risk averse in wealth (which is a stake in the firm's equity), then managers of high-value firms signal their type by issuing debt. Managers of low-value firms prefer to avoid the additional risk imposed on the equity claim when debt exists, and so their firms issue equity. In the pure signaling analysis of the John model, the firm pre-commits to implementing investment policies that are more risky than optimal. Ravid and Sarig build a full-information valuation model for the firm that they base on cash flows, corporate taxes, bankruptcy costs, and limited liability. In this framework, Ravid and Sarig obtain a separating equilibrium in which debt and dividends serve as signals of firm quality. These three signaling models also find a positive correlation between financial leverage and firm quality.

The Brick, Frierman, and Kim (1998) model is unique, in that the information asymmetry is only about variance of returns. In this model, the authors assume risk-neutral investors, but the firm's full information value is related to return variance through limited liability and corporate taxes, all else equal. The result is a model in which, when information is symmetric, the firm's variance determines its optimal financial leverage. When information about the variance is asymmetric, a lower level of leverage signals a lower variance of firm returns, all else equal. In the signaling equilibrium, a higher-value firm has a lower debt level. This result, in which firm variance, taxes and bankruptcy costs drive differences in firm value, contrasts with the signaling models reviewed above, where differences in firm value are driven by differences in expected cash flows and where more debt signals higher quality. Although the Brick, Frierman, and Kim

model is instructive, lower variance usually implies other differences in firm value under risk aversion. At present, we are not aware of any debt-equity signaling model that considers asymmetric information about firm value driven (at least in part) by asymmetric information about firm risk under risk aversion.

Vermaelen (1984), Persons (1994, 1997), and McNally (1999) model firms' incentives to repurchase shares, holding investment fixed. In these models, better (potentially undervalued) firms repurchase shares to distinguish themselves from worse firms. The Vermaelen and McNally models use a Leland and Pyle-type managerial incentive structure. The Persons' model uses a shareholder heterogeneity device. Since a share repurchase increases a firm's financial leverage, these models suggest a positive correlation between leverage and expected future cash flows.

3.3. Empirical evidence on leverage signaling

There are several empirical predictions that emerge from the capital structure signaling models in which firms' investment is fixed. If better quality is based on higher profitability, and if we assume asymmetric information in firm's profits, more-profitable firms have the incentive (and ability) to maintain higher levels of debt in order to signal their value to the market. Yet, Harris and Raviv (1991) observe that much empirical research, including Titman and Wessels (1988), has found the opposite, a negative cross-sectional relation between financial leverage and profitability. Comprehensive studies by Rajan and Zingales (1995), Frank and Goyal (2000), and Fama and French (2002) confirm this empirical finding.

Capital structure signaling models predict that higher-value firms will have more financial leverage, given a firm's book value of assets. Again, cross-sectional findings by Rajan and Zingales and Frank and Goyal are not consistent with this prediction. These studies report a negative empirical relation between firms' financial leverage and the market-to-book ratio.

Although this finding is consistent with the growth-opportunities argument for lower leverage suggested by Myers (1977), Rajan and Zingales raise the possibility that the finding is evidence that firms try to time the market by issuing equity when the market-to-book ratio is high.

We note that cross-sectional analyses may not be the best tests for signaling models, since the signal could be lost in the noise of variation in other factors that might drive capital structure. To explain cross-sectional variation, we must also assume that firms are alike on all other dimensions. Put another way, capital structure signaling might be valid, even if other factors explain the capital structure differences across firms. Since it may well be that cross-sectional variation across industries and sectors mask the role of asymmetric information in capital structure choices, stronger evidence (and more in keeping with the spirit of the models) can be found in the event study literature.

Another implication of the fixed-investment leverage signaling models is that if a firm's managers believe that future profitability will be higher (lower) than current market expectations, then they should conduct a leverage-increasing (decreasing) capital structure transaction. The empirical implication of this finding is that we would expect positive (negative) stock price reactions in response to capital structure changes that increase (decrease) leverage.

This empirical implication may also hold even in the Brick, Frierman, and Kim (1998) model, where better quality firms have the incentive (and the ability) to reduce leverage to signal reduced variance to the market. Increasing (decreasing) leverage is associated with a decrease (increase) firm value, but there will be an additional impact on how firm value is divided between debt and equity value. Using the call option view of equity, a higher (lower) volatility of firm returns, all else equal, will imply a higher (lower) equity value. Thus, even in this model, it

is possible for leverage-increasing (decreasing) transactions to have a positive (negative) stock price impact.

Event studies involving changes in capital structure have provided a significant amount of evidence indicating that information is conveyed. Moreover, the event study findings are consistent with the spirit of the theoretical models of capital structure and signaling. Harris and Raviv summarize some well-known results from the 1980s that, on average, announcements of leverage-increasing (decreasing) transactions have been accompanied by share price increases (decreases), except in the case of public debt issues, which have been accompanied by insignificant share price changes.[2] Masulis (1980) and Vermaelen (1981) find that repurchases financed from debt had larger announcement returns than those financed with cash. Since repurchases financed with debt represent larger increases in financial leverage, this finding is consistent with the theory of capital structure signaling.

More recent empirical studies have found similar results for four types of leverage-changing transactions: exchange offers (including swaps), forced conversion of bonds to equity, share repurchases, and seasoned equity offers (SEOs). The results in these studies are consistent with the empirical implications of capital structure signaling models that announcements of leverage-increasing (decreasing) capital structure changes result in positive (negative) share price reactions.[3] Erwin and Miller (1998) document negative returns for the rivals of firms announcing

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[2] For example see Masulis (1980, 1983), Vermaelen (1981), Dann (1981), Asquith and Mullins (1986), Mikkelson and Partch (1986), Masulis and Korwar (1986), Pinegar and Lease (1986), Shipper and Smith (1986), Kalay and Shimrat (1987), and Israel, Ofer, and Siegel (1989). For surveys of the early event study literature see Smith (1986) and Masulis (1988).

[3] For empirical studies of exchange offers and swaps, see Copeland and Lee (1991), Shah (1994), Born and McWilliams (1997), and Lie, Lie, and McConnell (2001). For studies of forced conversions of debt to equity, see Campbell, Ederington, and Vankudre (1991). For studies of share repurchases (leverage-increasing), see Lakonishok and Vermaelen (1990), Comment and Jarrell (1991), Howe, He and Kao (1992), Ikenberry, Lakonishok, and Vermaelen (1995), Ikenberry and Vermaelen (1995), Erwin and Miller (1998), Chan, Ikenberry, and Lee (2001), and Maxwell and Stephens (2001).

repurchases, which supports the notion that the information conveyed is firm level, not industry-level. Maxwell and Stephens (2001) find that repurchase announcements are accompanied, on average, by negative bond returns. This finding suggests that wealth is redistributed from debtholders to stockholders.[4] Technically, neither share repurchases nor SEOs will change the financial leverage of an all-equity firm, but the transactions appear to convey information anyway, as in Ferris and Sant (1994). The positive share price reaction to repurchase announcements could be interpreted as supporting the signaling model of Miller and Rock (1995), and the negative share price reaction to SEO announcements may be interpreted as supporting the adverse selection model of Myers and Majluf (1984).

The event study evidence on announcement of debt issues does not provide much support for signaling theories. Early studies by Dann and Mikkelson (1984), Eckbo (1986), Mikkelson and Partch (1986), and Shyam-Sunder (1991) find insignificant changes in stock prices in response to straight corporate debt issues. Chaplinsky and Hansen (1993) point out that these results might be due to the predictability of the debt offerings, but Manuel, Brooks, and Schadler (1993) report significantly negative stock price reactions to announcements of debt issues that closely precede dividend and earnings announcements. Johnson (1995) finds significantly positive stock price reactions to debt issue announcements for low-dividend payout firms. Howton, Howton, and Perfect (1998) report significantly negative stock price reactions to announcements of straight debt issues without conditioning on dividend or earnings announcements, and that the stock price announcement is inversely related to investment opportunities (Tobin's Q).

[4] For studies on seasoned equity offers (leverage-decreasing), see Korajczyk, Lucas, and McDonald (1991), Brous (1992), Jain (1992), Choe, Masulis, and Nanda (1993), Brous and Kini (1994), Eckbo and Masulis (1995), Loughran and Ritter (1995), Speiss and Affleck-Graves (1995), and Clarke, Dunbar, and Kahle (2001).

These event studies of capital structure signaling with fixed investment generally indicate that capital structure transactions do convey information. At present, it remains unclear whether the information pertains to managers' private information about future profitability, changes in risk, and/or managements' belief that shares are simply misvalued by the market (even if the managers have no private information about future profitability or risk.)

In addition to the short-term impact of announcements on share prices, several studies examine long-term firm performance subsequent to capital structure changes. Harris and Raviv summarize the early attempts at analyzing long-term performance. Cornett and Travlos (1989) show that firms' earnings tended to increase (decrease) after leverage-increasing (decreasing) events. Dann, Masulis, and Mayers (1991) report evidence of earnings increases after share repurchases. Israel, Ofer, and Siegel (1989) report than analysts revise firms' earnings estimates downward in response to firms' offers to exchange equity for debt.

There is now an extensive empirical literature on the issue of firm performance after capital structure transactions. Copeland and Lee (1991), Shah (1994), Born and McWilliams (1997), and Lie, Lie, and McConnell (2001) examine exchange offers, the cleanest leverage-changing transaction, holding investment constant. Copeland and Lee report that systematic risk dropped (rose) after leverage-increasing (decreasing) exchange offers. This finding is consistent with managers increasing (decreasing) leverage when they foresee a change in firm value due to a decrease (increase) in their firm's business risk. However, this finding does not explicitly correspond to existing capital structure signaling theory. Shah's work shows that leverage-decreasing transactions are followed by abnormal reductions in operating cash flows (not earnings), but that leverage-increasing transactions are not followed by increases. On the other hand, on average, leverage-increasing offers precede declines in the systematic risk of the firm's

equity, but leverage-decreasing events do not precede increases. Since the increase in financial leverage generally results in higher systematic equity risk, Shah concludes that the operating risk of the firm often falls after a leverage-increasing exchange offer. Born and McWilliams find no pattern of subsequent firm performance subsequent to equity-for-debt exchange offers that supports a signaling theory. Lie, Lie, and McConnell find evidence suggesting that debt-reducing exchange offers contain information that a firm is financially weaker than would have been apparent from other public information.

The finding of decreasing systematic risk with some leverage-increasing transactions suggests that these transactions might convey information on changes in systematic risk. Reported empirical evidence, including cross-sectional studies, suggests that the theory of leverage signaling lags the empirical evidence. We are aware of no equilibrium models of leverage signaling involving private information about a firm's systematic risk or the misvaluation of that risk in the market. In general, the empirical evidence on debt issues is more supportive of the pecking order theory than it is of signaling with capital structure. Perhaps this is because investment is not held fixed in this type of leverage-increasing transaction, as is assumed in the signaling models discussed above.

Operating performance and share price performance after repurchases and SEOs have also received a great deal of attention. Dann, Masulis, and Mayers, Bartov (1991), and Hertzel and Jain (1991) examine share repurchases, and all find evidence of earnings increases and of systematic (equity and asset) risk reductions after the repurchasing event. Lie and McConnell (1998) and Nohel and Tarhan (1998) confirm these results on earnings. However, Jagannathan and Stephens (2001) find no empirical evidence of improved operating performance after repurchases, and Grullon (2000) reports a significant decline in operating income and in

analysts' earnings forecasts after repurchase announcements. Grullion's findings are consistent with Shah's results on leverage-increasing exchanges.

Lakonishok and Vermaelen (1990), Ikenberry, Lakonishok, and Vermaelen (1995), and Chan, Ikenberry, and Lee (2001) find that the share performance of repurchasing firms is abnormally high for two to four years after the repurchase announcement. The underreaction findings led these authors to hypothesize that not only are shares undervalued when repurchases are undertaken, but also that it takes the market a long time to respond to the information provided in a repurchase announcement.[5] Dittmar (2002) also contends that share repurchase decisions are based on undervaluation.

Hansen and Crutchley (1990), Ferris and Sant, McLaughlin, Safieddine, and Vasudevan (1996), and Loughran and Ritter (1997) document significant declines in operating performance subsequent to SEOs. However, Healy and Palepu (1990) report no decrease in firms' realized earnings. They also find, along with Lease, Masulis, and Page (1991) a significant increase in post-offering systematic risk. Brous (1992) and Jain (1992) report a downward revision in analysts' earnings forecasts in response to SEO announcements. Evidence on long-term stock performance reported by Loughran and Ritter (1995) and Speiss and Affleck-Graves (1995) documents abnormally poor equity returns for several years after an SEO, suggesting that the market under reacts to the SEO announcement. Speiss and Affleck-Graves (1995) and McLaughlin, Safieddine, and Vasudevan (1998) document similar results on long-term performance subsequent to bond issues. These findings sparked an on-going debate, with Fama (1998), Eckbo, Masulis, and Norli (2000), and Brav, Geczy, and Gompers (2000) suggesting

[5] See Grullon and Ikenberry (2000) for a discussion of this underreaction evidence and the information content of repurchases.

methodological explanations to this long-run underreaction anomaly, with Jagedeesh (2000) and Loughran and Ritter (2000) arguing that the observed underreaction is robust.

There is increasing evidence that managers behave opportunistically when issuing equity by timing SEOs to take advantage of high stock prices. Clarke, Dunbar, and Kahle (2001) report direct evidence that insiders attempt to issue overvalued equity with SEOs and cancel the issue if the announcement happens to eliminate the overvaluation. Jindra (2001) uses models of equity valuation to demonstrate that equity is issued at the time of maximum overvaluation, because of the overvaluation. Korajczyk, Lucas, and McDonald (1991) and Loughran and Ritter (1995) offer evidence that SEOs occur after extremely high returns on the firm's equity. Teoh, Welch, and Wong (1998), Rangan (1998), and Teoh and Wong (2002) suggest that not only do managers behave opportunistically, but by using earnings management' prior to SEOs they may even contribute to the overvaluation of their firm's shares by making investors overly optimistic. Brous, Datar, and Kini (2001), Denis and Sarin (2001), and Hansen and Sarin (1999) question whether the market is overly optimistic about future profitability. Shivakumar (2000) questions whether earnings management by issuers is deliberately intended to mislead investors or simply reflects a rational response to anticipated market behavior at offering announcements under an extended Myers and Majluf setting.

The evidence on long-term performance suggests that markets underreact to the information conveyed in the announcements of repurchases and SEOs. Positive repurchase announcement effects are followed by positive abnormal returns and negative SEO announcement effects are followed by negative abnormal returns. Event studies of capital structure signaling with fixed investment generally indicate that capital structure transactions do convey information. However, at present, it remains unclear whether the information pertains to

managers' private information about future profitability, changes in risk, and/or managements' belief that shares are simply misvalued by the market (even if the managers have no private information about future profitability or risk.)

4. Signaling and new investment

4.1. The Myers-Majluf model

When there is asymmetric information between managers and investors, firms raising external capital to fund new projects face an adverse selection problem. Firms with less-valuable opportunities can issue securities that mimic those offered by firms with more-valuable opportunities, resulting in overvalued securities for low-valued firms and undervalued securities for high-valued firms. This adverse selection problem forms the base of much of the theoretical literature that attempts to explain the preference for issuing one type of claim over another, and it is the underpinning of capital structure research initiated by the pecking order hypothesis developed in Myers and Majluf (1984) and Myers (1984).

In the Myers and Majluf model, managers with superior information, acting in best interests of old shareholders, will issue equity when the equity is overpriced. Moreover, managers will pass up positive NPV investments if the equity necessary to finance them is sufficiently underpriced by the market. Therefore, the decision to issue equity and invest will convey negative information to the market and the price will drop at the announcement. Myers and Majluf suggest that the underinvestment problem can be avoided by issuing a security with less risk, a security that is less sensitive to mispricing (riskless debt, for example, cannot be mispriced). Given the underinvestment problem, capital structure is driven by a hierarchy of preferences, or a pecking order, for the issuance of new capital. Managers will prefer internal funding (or riskless debt) to risky debt, which, in turn, they prefer to equity.

To review how this model works, consider a firm that has assets in place with value A, which is known only to insiders, and a growth opportunity with value B, which is known to all. An equity issue of E is required to finance the growth opportunity. Let $B > E$ so that the project has a strictly positive NPV. The firm's only decision is whether to issue equity and invest or to pass up the growth opportunity, and this decision is made to maximize the value of the existing shareholders' claim. There are two states of nature, where A can have either a high value (A_H) or low value (A_L). The firm knows the true state, but the market knows only that each state is equally likely. Let P be the market value of the firm if it issues and invests, and thus, P is the value of the growth opportunity plus the expected value of A. The proportion of firm value that the old shareholders retain is $\frac{P}{P+E}$, and the value of the old shareholders' claim in each of the two states is $\frac{P}{P+E}(A+B)$ where A is either A_H or A_L.

Under asymmetric information, the firm is better off passing up the growth opportunity in the high state because the equity is undervalued; the old shareholders would have to give up (to the new shareholders) a substantial portion of the value of the assets in place. In fact, they give up more than the share of the NPV they gain by investing in the growth opportunity. The condition that determines whether or not the firm will issue and invest compares the value of the old shareholders claim if the firm does not invest, which is the value of assets in place, A, to the value of the old shareholders' claim if the firm does invest, $\frac{P}{P+E}(A+B)$. Thus, the firm will invest if and only if $\frac{P}{P+E}(A+B) > A$. Rearranging this expression gives us the following intuitive condition: $\frac{P}{P+E}B > \frac{E}{P+E}A$. The left-hand side is the value of the growth opportunity that is

captured by the existing shareholders and the right-hand side is the value of the assets in place that the existing shareholders give up to the new shareholders. The firm will invest if and only if the value of the growth opportunity captured by the old shareholders is greater than the value of the assets in place that they must give up. We note that this inequality will hold for low values of A but not for high values of A.

This model illustrates that if equity is the only financing choice, a firm's optimal strategy differs across states: firms will issue and invest if equity is overvalued, but they may pass up a growth opportunity if equity is undervalued. Thus, the decision to issue equity and invest conveys negative information to the market about the value of the firm's assets in place. Myers and Majluf also show that this same underinvestment problem is avoided entirely if the firm finances with internal funds or riskless debt. Financing with risky debt can lead to the same type of underinvestment problem as financing with equity, but it is less severe because the value of debt is less sensitive to information and will suffer less from underpricing. Therefore, the Myers and Majluf model predicts there is a hierarchy of preference for funding new investments. Firms are better off if they carry financial slack to undertake good investment opportunities from internally generated capital. If external financing is required, the least risky claim is best, which implies that debt is preferable to equity. The model indicates that an equity issue announcement will cause the firm's stock price to decline, but there will be little (no) stock price reaction to the announcement of risky (riskless) debt issues.

The insights from the development of the pecking order theory of financing new investments in an asymmetric information environment spawned additional work as researchers investigated the robustness of Myers and Majluf's underlying assumptions. Much of this work considers ways in which firms can signal their value when issuing equity, thereby eliminating (or

reducing) the adverse selection problem. These models provide differing implications for the pecking order hypothesis.

4.2. Signaling firm value with new equity

Daniel and Titman (1995) partition equity signaling models into four different categories of signals: money burning at the time of equity issue, commitments to burn money out of future revenues, investment scaling, and price-setting (overpricing) of the equity issue. "Money burning" refers to purely dissipative signals. These signals confer no direct benefits to the firm and involve the same nominal cost to both high and low firm types. Examples of models in which money is burned at the time of the equity issue are the underpricing models of Allen and Faulhaber (1989), Grinblatt and Hwang (1989), and Welch (1989). Models in which commitments are made to burn money out of future revenues include the John and Williams (1985) dividend-tax model and the Choe, Masulis, and Nanda (1993) project-delay model. Daniel and Titman demonstrate that commitments to burn money out of future revenues are less costly to high-value firms than low-value firms, and thus are more efficient signals than money burning at the time of issue.

The most efficient signals according to Daniel and Titman are investment scaling and equity overpricing. Krasker (1986) presents a model of investment scaling that relaxes the Myers and Majluf (1984) assumption that the growth opportunity is indivisible. In Krasker's model, the firm is allowed to decide not only if the investment should be undertaken, but also how much new equity should be issued. The amount by which the project is scaled back serves as a signal of the firm's assets in place. Daniel and Titman discuss an equity-overpricing model similar to that of Giammarino and Lewis (1988) in which the high-type firm sets an offering price for the equity at the full-information value, above the ex-ante market price, and investors fund the project with some probability. In equilibrium, this probability is just low enough to prevent the

low-type firm from mimicking. Daniel and Titman also discuss scenarios in which the most efficient signal is a combination of investment scaling, overpricing, and money burning from future revenues. In these scenarios, the optimal combination depends on the marginal return on investment, the nature of the asymmetric information, and the correlation between the project and the assets in place. An example in which investment scaling and money burning from future revenues form an optimal combination of signals is in Ambarish, John, and Williams (1987).

The Myers and Majluf pecking order result depends critically on the assumption that managers act in the interests of the current shareholders. For example, Bradford (1987) allows managers to own and trade in the firm's shares, with the objective of maximizing insiders' wealth. The ability of managers to buy shares increases the states in which investment is undertaken, which contrasts with Myers and Majluf simpler assumption of two states. Managers' trades allow them to recoup losses when their firm is undervalued and this situation encourages them to invest in more states in which the firm is undervalued.

In other equity-only extensions of Myers and Majluf, the pecking order hypothesis does not obtain. One example is the model by Cooney and Kalay (1993), which allows the NPV of the project to take on negative values. Myers and Majluf rule out this possibility based on the notion that zero-NPV investments in capital market securities are always available alternatives. Another example is the multi-period model of Viswanath (1993). In this model, a firm may be better off by issuing equity in the first period and conserving slack for the second period, depending on the nature of the information asymmetry expected in the two periods. Daniel and Titman (1995) demonstrate that if firm variances are unequal and firm variances are asymmetric information, while firm values are equal and known by the market, then there is no adverse selection problem if equity is issued. Since issuing debt is a dominated strategy, the pecking order is reversed in

this setting. Daniel and Titman credit a working paper by Giammarino and Neave (1982). Myers (1984) also notes this result.

4.3. Signaling firm value with new debt and equity

The theories we have just discussed restrict the financing choice to equity only. Expanding this choice to a richer set of financing claims yields more robust insights, only some of which are consistent with the pecking order theory. In addition, a more comprehensive treatment of managerial objectives provides new insights into capital structure and the fund-raising process.

The Modigliani and Miller (1958) capital structure irrelevance result obtains because individuals may undo corporate leverage changes via an offsetting leverage change in personal portfolios. In contrast, Myers and Majluf (1984) assume that investors are passive and do not rebalance their portfolios when a firm issues new securities to fund a project. If managers issue debt to prevent the sale of undervalued shares to new outside investors, and if shareholders rebalance their personal leverage as they do in Modigliani and Miller, then the shareholders will sell undervalued shares from their personal account. Thus, as Daniel and Titman (1995) argue, issuing debt when shares are undervalued and investors are active rebalancers leads back to capital structure irrelevance, not to the pecking order hypothesis.

However, the underinvestment problem does not go away since firms may reject positive NPV projects when shareholders are active rebalancers. In addition, the Myers and Majluf assumption of passive shareholders is inconsistent with common models of equilibrium in capital markets in which each investor purchases a pro-rata share of any new debt or equity issue. If investors are assumed to be active in this sense, the underinvestment problem does go away.

Thus, Daniel and Titman show that the assumption of just how passive shareholders are is crucial to both the adverse selection result and the pecking order hypothesis.[6]

Nevertheless, many capital-structure signaling models retain the passive shareholder assumption. Narayanan (1988) uses a model with a continuum of firm types with no assets in place and insufficient internal funds to finance a growth opportunity. Thus, Narayanan extends Myers and Majluf by allowing firms to issue risky debt. Narayanan shows that debt is attractive to firms with strong growth potential (high-quality firms), even if it is not useful as a signaling device to separate them from firms with negative NPV projects (low-quality firms). As in Myers and Majluf, if firms are restricted to equity only, above-average-quality firms are undervalued and below-average-quality firms are overvalued, because the pooling equity price reflects average firm value. Below-average-quality firms will issue equity and invest if the equity is overpriced by more than the shortfall in the project NPV. In this case, some below-average and all above-average-quality firms issue debt and invest. Conversely, many below-average-quality firms that would issue overpriced equity will stay out of the debt market because the benefits of being overvalued are lower with a fixed claim and may not exceed the project's negative value. Thus, debt financing results in higher average firm quality. Essentially, debt acts as a barrier to entry that keeps the worst firms out of the market, which improves the pool, and therefore improves the efficiency of valuations. Above-average-quality firms are less undervalued and below-average-quality firms are less overvalued, which leads to a social welfare improvement over the equity case. Thus, Narayanan's finding supports the pecking order theory.

[6] Dybvig and Zender (1991) present a theory in which managers are compensated to act in the interests of active shareholders who subscribe to new equity issues on a pro-rata basis. In this context they generate a capital structure irrelevance result.

Noe (1988) analyzes a financing and investment model as a formal signaling game and shows that the pecking order theory is sensitive to the nature of insiders' information. When there is perfect insider information, firms choose debt financing over equity. However, when insiders have residual uncertainty, some firms will strictly prefer equity to debt financing. Debt is assumed to be riskless for high-quality firms (*H*) and medium-quality firms (*M*), but risky for low-quality firms (*L*). In equilibrium *H* and *L* issue debt and *M* issues equity. The market correctly infers the value of *M*, but the market cannot distinguish between *H* and *L* because both types use debt. As long as the values of *H* and *M* firms are sufficiently different, *L*'s debt would be more overpriced than its equity, even though equity is more informationally sensitive than debt. Thus, *L* prefers to issue debt instead of equity. If *M* were to issue debt (which is risk free by assumption) the issue would be pooled with *L*'s risky debt and *M*'s debt would be undervalued. Thus, *M* prefers to issue equity. If *H* were to issue equity rather than debt, it would be indistinguishable from *M*, and its equity would be undervalued. However, because debt is less informationally sensitive than equity, *H*'s debt is less underpriced when pooled with *L*'s debt than is its equity when it is pooled with *M*'s equity. Thus, even though *H*'s choice of debt, which is the signal that distinguishes *H* from *M*, is costly, it is less costly than the alternatives. This equilibrium rejects the pecking order theory because *M* strictly prefers equity to debt financing. Nevertheless, Noe's model supports the empirical notion that equity issues prompt negative stock price responses. Although it is not the worst-quality firm that chooses equity, firms that choose debt are of higher average quality than are firms that choose equity. The model also predicts a positive stock price reaction to a debt issue.

Brennan and Kraus (1987) and Constantinides and Grundy (1989) present models in which the firm's financing choice costlessly signals firm quality and prevents underinvestment.

Brennan and Kraus present an example in which they assume that there are two types of firms, *H* (high cash flow/value) and *L* (low cash flow/value). Both firms have existing debt. The high cash flow of *H* ensures that its debt is risk free, while the low cash flow of *L* implies its debt is risky. Brennan and Kraus provide both necessary and sufficient conditions for the existence of a separating equilibrium under very general conditions. In the separating equilibrium, type *L* issues just enough equity to finance the growth opportunity, and type *H* issues enough equity to finance the growth opportunity and retire its debt. The market correctly infers the firms' types from their actions because neither firm has an incentive to deviate (since, in a costless signaling equilibrium, incentive compatibility must run both ways). Type *H* will not mimic type *L* by offering just enough equity to finance its project because the market would then perceive it as type *L* and equity would be underpriced. Type *L* will not mimic type *H* by issuing additional equity to retire their debt because the market would perceive it as type *H* and overvalue the debt. The cost of the overpriced debt outweighs the benefit of the overpriced equity.

Daniel and Titman also review a Brennan-Kraus scenario in which the two firms have the same expected cash flows but different variances. The firm with the higher variance signals its type by issuing subordinated debt, while the lower variance firm issues equity. Franke (1987) also derives a costless separating equilibrium in which firms signal their type through capital structure decisions.

In Constantinides and Grundy managers are assumed to own equity in their firms, and firms may issue any type of claim and may repurchase equity. Like Brennan and Kraus, Constantinides and Grundy prove the existence of a separating equilibrium in which there is no underinvestment. Firms finance the growth opportunity with a convertible debt issue that is sufficient to also repurchase part of the firm's equity. However, managers are not allowed to

trade their equity claims or to tender them in a repurchase. The stock repurchase and the restriction preventing managers from tendering their shares enforce incentive compatibility. Higher-valued firms issue more convertible debt and therefore repurchase more equity (investment is assumed to be fixed). Higher-valued firms will not deviate and offer less convertible debt (even though mimicking worse types would allow such firms to repurchase its equity at a lower price) because the lower conversion price commensurate with a lower-valued firm would undervalue its equity. Similarly, lower-valued firms will not deviate and offer more convertible debt (even though the conversion price commensurate with a higher-value firm would overvalue their equity) because the firms would then have to overpay for the equity repurchase.

In an alternative specification of their model, Constantinides and Grundy show that a fully separating equilibrium exists with a combination of straight debt and a stock repurchase. In this example, a firm's investment level is assumed to be endogenous. The announcement of the investment level replaces the conversion price used to signal (along with the face value of the debt). We note that for the market to take this as a credible signal, the firm's investment must be observable.

Brennan and Kraus and Constantinides and Grundy obtain equilibrium outcomes that are not consistent with the pecking order hypothesis. There are two key differences in these equilibrium outcomes, compared to those suggested by Myers and Majluf. First, there is no underinvestment because both firm types invest. Second, even though the Brennan and Kraus model allows firms to issue debt to finance growth opportunities, all firms prefer to issue equity, thus upsetting the pecking order theory. Moreover, the model predicts a negative stock price reaction to issuing equity, but a positive stock price reaction when firms simultaneously issue

equity and use some of the proceeds to retire debt. In Constantinides and Grundy (as in Brennan and Kraus), the signal is costless and there is no underinvestment. Thus, although firms issue (convertible) debt, there is no strict preference to finance with retained earnings or risk-free debt.

Heinkel and Zechner (1990) analyze an expanded menu of risky securities that includes preferred stock. Assuming a given capital structure and asymmetric information about project quality, they show that in a pooling equilibrium, all-equity firms tend to overinvest and accept some negative NPV projects. An initial debt issue can eliminate the overinvestment behavior, resulting in an optimal leverage ratio. If managers consider the tax benefit of debt, then the incentive to use even more debt creates an underinvestment problem. However, a concurrent issue of preferred stock will allow the firm to issue the higher level of debt desired without creating underinvestment. Therefore managers develop an optimal capital structure with debt, preferred stock, and common stock that is consistent with the pecking order.

Nachman and Noe (1994) also consider a wider range of financing options than just debt and equity. Their model considers the inferences that market participants can draw about the productivity of firms offering the securities and the ordering of the firm's productivity. Their model establishes the characteristics of the probability distribution of a project's future cash flow that are necessary to ensure that debt is preferred to equity. Nachman and Noe find that the pecking order holds only under specific conditions. Debt is optimal if and only if cash flows are ordered by strict conditional stochastic dominance.

Noe and Rebello (1996) merge adverse selection with agency considerations, given that managers pursue objective functions different from that of shareholders. In the absence of asymmetric information, shareholders prefer debt financing with the accompanying threat of bankruptcy and high dividends, because these factors increase their control over the share of

profits or rents that the manager can capture. Managers prefer to minimize debt financing and issue equity to maximize the managerial rent appropriation. Informational asymmetry and the costs associated with the adverse selection problem can change these preferences. If shareholders control financial policies, they base their preference for debt or equity on the tradeoffs between the costs of increased rent concessions and the cost of adverse selection. Shareholders will prefer equity financing only if the adverse selection costs are greater than the costs of the rents given up to management.

The Noe and Rebello (1996) theory predicts that under shareholder control, a greater reliance on debt financing conveys less favorable information and increased equity financing conveys favorable information. However, if managers are in control, they trade off the benefits of increased rents against the costs of adverse selection. Managers will issue debt and give up the benefits of additional rents only if the costs of adverse selection are high. The theory predicts that under manager control a higher reliance on debt financing conveys more favorable information.

Security design models illustrate that the link between information asymmetry and a firm's choice of financing claim runs both ways. These models do so by exploiting the fact that the value of a residual claim is more sensitive to information than the value of a fixed claim. Boot and Thakor (1993) show that good firms will want to partition their securities so that some of the claims (equity) will be informationally sensitive, which gives investors incentives to produce information. In a pooling equilibrium, bad firms will follow suit so as not to be identified in the market.

Fulghieri and Lukin (2001) expand this intuition by considering the cost of becoming informed and by allowing for noisy information from outside investors. The authors find that

when outside investors can produce noisy information about firm's quality, the degree of information asymmetry depends on the information sensitivity of the security issued. If the cost of becoming informed is low, then firms may prefer a higher information sensitive security, such as equity, to promote information production by "specialized" outside investors. Increased informed trading reduces information asymmetry and promotes trading. If the cost of becoming informed is sufficiently high, then the company will issue risky debt. Fulghieri and Lukin find that the preference for equity increases with the NPV of the project being funded and the level of informational asymmetry. Firms with larger growth opportunities and younger firms are more likely to be equity financed, and mature firms with low market-to-book ratios are more likely to be debt financed.

When Fulghieri and Lukin extend their analysis to optimal security design, they find that when information acquisition costs are sufficiently high, the optimal security is risky debt. However, when information acquisition costs are sufficiently low, the firm will choose a security with a convex payoff (a composite security of equity and call options or a warrant). Thus, Fulghieri and Lukin find that the firms' preference for equity over debt depends on cost of information production, precision of information-production technology, and extent of information asymmetry.[7]

4.4. Empirical research on the pecking order hypothesis

Under the Myers and Majluf (1984) pecking order hypothesis, the announcement of an SEO is perceived as a negative signal by the market, which leads to the empirical prediction that the value of the company should drop at the announcement of new stock issues. Because debt is

[7] Boot and Thakor (1993) and Fulghieri and Lukin (2001) are supply-side theories of security design. For demand-side theories of security design see, for example, Allen and Gale (1988, 1991) and Gorton and Pennacchi (1990).

less sensitive to information asymmetry, the announcement of a risky debt issue is somewhat less negative.

Harris and Raviv (1991) cite the early event-study literature (covered in the previous section) that documents significant negative announcement effects for SEOs and insignificant announcement effects for straight debt as evidence consistent with the pecking order hypothesis. Among early direct tests of the pecking order hypothesis, Amihud, Lev, and Travlos (1990) and Chaplinsky (1993) find supporting evidence, and Korajczyk, Lucas, and McDonald (1991) reject the pecking order hypothesis. We review a sampling of the more recent literature.

Rajan and Zingales (1995) analyze the cross-sectional relation of company factors with leverage for major industrialized countries. Under the pecking order hypothesis, firms with few tangible assets have greater asymmetric information and should use more debt. This hypothesis is rejected, because leverage is positively related to tangibility (fixed to total assets) for both book and market values of leverage. However, they provide other evidence that cannot reject the pecking order hypothesis.

Jung, Kim, and Stulz (1996) also find mixed evidence on the pecking order. Consistent with the pecking order hypothesis, they find that announcement returns are negative and significant for stocks and insignificant for bonds. However, they also find that some firms issued equity to fund good investment opportunities even though by doing so these companies resemble firms that issue debt. Other equity-issuing firms have poor investment opportunities and some debt capacity. Under the pecking order hypothesis, this situation is only possible if asymmetric information is not important. However, these companies also have a more negative stock price reaction to equity issues than firms with better opportunities.

Jung, Kim, and Stulz also find companies with large total assets – firms more closely followed by analysts, who reduce information asymmetries – are less likely to issue equity. This finding is contrary to the pecking order hypothesis. Jung, Kim, and Stulz suggest that the choice to issue equity can better be explained by agency considerations where manager's discretion is enhanced than by the pecking order hypothesis.

In support of the Myers and Majluf theory, D'Mello and Ferris (2000) observed significantly more negative announcement period returns for firms with more information asymmetry. They used a fewer number of analysts following the company and less consensus as a proxy for information asymmetry.

Helwege and Liang (1996) analyze financing choices of firms that had recently gone public. Such firms are more likely to be opaque to investors, and they are more likely to have insufficient internal funds because they tend to be young, high-growth firms. Results from their sample reject the pecking order hypothesis: these firms do not avoid external financing, are as likely to issue equity as public debt, and prefer equity to bank loans. Moreover, within their sample of opaque firms, the asymmetric information proxies they use have no ability to predict firms' decisions to issue equity or debt. However, Helwege and Liang do find that firms with surplus funds avoid capital markets, which is consistent with the pecking order hypothesis.

Recent empirical studies of the pecking order hypothesis test the theory against the static tradeoff, or target adjustment, theory of capital structure. The static tradeoff theory specifies that a firm has an optimal capital structure, which trades off the tax and discipline benefits of debt with the increased costs of agency, financial distress, and bankruptcy. Thus, an overleveraged firm will issue equity and an underleveraged firm will issue debt to move the company toward an optimal capital structure.

Although the pecking order and static tradeoff theories of capital structure are not mutually exclusive, some empirical studies have devised tests to distinguish between the two hypotheses. Shyam-Sunder and Myers (1999) test the pecking order hypothesis against the static tradeoff theory of capital structure by using the statistical power of a time series variance in debt ratios. Their model is based on the premise that changes in debt ratios result from the need for external funds rather than a desire to maintain an optimal capital structure. Shyam-Sunder and Myers estimate the need for funds as cash flow deficits, found by adding dividend payments, capital expenditures, change in net working capital, and the current portion of long-term debt, and subtracting operating cash flows after interest and taxes. They test the static tradeoff theory by regressing the difference in the previous period's debt level from the firm's target debt level (based on the company's long term average debt ratio) on the amount of debt issued or retired.

When Shyam-Sunder and Myers test the models independently, both describe the variation in debt ratios. However, based on explanatory power, the pecking order model is superior. Additionally, they test the two models with simulated data based on either the pecking order hypothesis or the target adjustment hypothesis. The pecking order hypothesis does not hold if the simulated data is based on a target adjustment, which suggests that the Shyam-Sunder and Myers test has the power to reject the pecking order hypothesis. However, the target adjustment still holds even if the data is based on the pecking order hypothesis, indicating a false positive. If both models are nested in the same regression, Shyam-Sunder and Myers find similar results. If the static tradeoff model is applied with cross-sectional tests that include ratios of research and development, plant, earnings, and tax-loss carryforwards to assets, the same results hold. Overall, the results suggest greater confidence in the pecking order hypothesis than the target adjustment model.

Chirinko and Singha (2000) argue that the model developed by Shyam-Sunder and Myers generates a host of misleading inferences. They point out that the empirical pecking order model developed by Shyam-Sunder and Myers is not an identity, because it does not include net equity issues. In addition, Shyam-Sunder and Myers do not consider debt capacity. Chirinko and Singha demonstrate that when a company follows the pecking order hierarchy and equity constitutes a much larger percentage of overall external financing, the model will reject the pecking order hypothesis even when the pecking order is valid. Thus, Chirinko and Singha state that the model is a joint test of the financial hierarchy and the percentage of equity in external financing.

Using the Shyam-Sunder and Myers model, Chirinko and Singha find that the results do not reject the pecking order hypothesis, even though the order of preference for debt and equity is reversed. Thus, they indicate that the model is not able to test the hierarchy of financing. Chirinko and Singha argue that alternative tests are needed.

Frank and Goyal (2000) also examine the robustness of the Shyam-Sunder and Myers model to alternative specifications, and find conflicting results. Using more current data and a holdout sample, they find that corporate debt is not determined by the financing deficit as Shyam-Sunder and Myers construct it in their empirical model. In addition, tests of the component parts of the cash flow deficit did not support the model. Frank and Goyal test whether the omission of other financial factors could be driving the results. Contrary to the adverse selection problem and the asymmetric information implications of the pecking order theory, rather than small and high-growth firms, it is the large firms with moderate leverage (based on book rather than market assets) that they find are the most consistent with the pecking order. They also select a narrow sample of firms most likely to follow a pecking order, and find that

none of the predictions of the pecking order hypothesis hold, but the mean-reverting leverage is similar to other firms in the economy.

Frank and Goyal question the Shyam-Sunder and Myers measure of the target debt ratio in the static tradeoff theory, since the optimal degree of leverage reflects a balance of financial factors. If the factors change, then the optimal ratio will change. Therefore, they use an unconditional and a conditional target adjustment framework and analyze the static tradeoff theory by testing mean reversion in financing behavior. Both the conditional and unconditional specifications produce results that support the static tradeoff theory.

Hovakimian, Opler, and Titman (2001) test the pecking order theory against the static tradeoff theory and allow the target capital structure to change over time. Their findings indicate support for the pecking order hypothesis over the short run, but that firms tend to move toward a targeted debt ratio. This finding is demonstrated by the fact that more profitable firms have lower leverage, but are more likely to issue debt than equity and retire more debt than equity. However, in a cross-sectional analysis, they find that variables indicating deviations between the actual and target debt ratios are more important in explaining the choice of issuing equity versus debt.

Fama and French (2002) also conduct comprehensive comparisons of the pecking order hypothesis and the tradeoff hypothesis with an extensive data set. Overall, the Fama and French results are mixed. They confirm empirically some shared aspects of the two hypotheses, but other tests reject each of the hypotheses. Fama and French are reluctant to draw any strong conclusions from the data.

The empirical work reviewed above does not offer convincing support for the pecking order hypothesis. Event-study tests support the prediction that share prices generally decline when equity is issued and are unaffected when debt is issued. These findings are consistent with

the adverse selection theory of Myers and Majluf. However, these results could be interpreted as a signaling effect even in the absence of a financial heirarchy. Only some of the predicted cross-sectional relations are consistent with the pecking order hypothesis, but they are also subject to other interpretations.

Helwege and Liang, Jung, Kim, and Stulz, and Frank and Goyal are clear in their rejection of the predictions of the pecking order hypothesis, and the results in Hovakimian, Opler, and Titman are more supportive of the tradeoff hypothesis. Shyam-Sunder and Myers conclude their study has evidence supporting the pecking order hypothesis, but Chirinko and Singha and Frank and Goyal raise some serious questions about their methodology and produce conflicting results. Finally, Baker and Wurgler (2002) do not find support for either the pecking order hypothesis or the static tradeoff theory of capital structure. Instead, they find evidence that market timing has large and persistent effects on capital structure.

5. Leverage adjustments and market timing

Lucas and McDonald (1990) and Korajczyk, Lucas, and McDonald (1992) are both dynamic models of asymmetric information. As in Myers and Majluf, these models assume that firms must issue stock to invest in growth opportunities. In Lucas and McDonald (1990), managers receive information one period before the market and act in the interest of long-term shareholders. If a firm requires funding for a project that has a long-term decision horizon and a delay in accepting the project has low cost, then an undervalued firm will choose to delay issuing equity until the true value of the firm is revealed and the share price rises. Conversely, if the firm is overvalued, the firm will issue equity immediately at its overvalued price and avoid the possibility of losing the project. If the arrival of growth opportunities is independent of price history, then overvalued firms will experience average performance before the issue and

undervalued firms will have above-average performance as they wait for the price to improve before they issue equity. Thus, on average, positive abnormal returns will precede equity issues. Also, on average, firms issuing equity will be overvalued. This finding is consistent with the decreases in price often found at stock issue announcements. Finally, if there are periods of time in which there are more undervalued firms than overvalued firms in the market, then there will be an upward trend in the market as the information about these firms is revealed. Following this market upswing, there will be an above-average number of equity issues because the (previously) undervalued firms waited to issue. In other words, equity issues tend to be clustered on the heels of above-average market performance.

Korajczyk, Lucas, and McDonald (1992) suggest that by choosing the timing of an equity issue managers can control to some degree the informational disadvantage of the market. After information releases, asymmetric information should be at its lowest point, buffering the negative stock price reaction to equity issues. Thus, firms will tend to time equity issues shortly after information releases. Moreover, the magnitude of the stock price decline should be positively related to the length of time between the issue and the most recent information release.

Recent empirical evidence provides considerable support for these predictions. As mentioned in Section 3.3, Rajan and Zingales (1995) interpret the negative correlation found between leverage and market-to-book value as evidence of market timing: firms tend to issue equity when the market-to-book ratio is high.[8] Empirical work by Choe, Masulis, and Nanda (1993), Bayless and Chaplinsky (1996), and Baker and Wurgler (2000) also suggests a relation between equity issues and the business cycle. Based on their result of insignificant excess returns

[8] See Taggart (1977) and Marsh (1982) for early treatments of the timing hypothesis of financing decisions.

over the five-year period following equity issues, Jung, Kim, and Stulz (1996) conclude that timing is not an important factor in the decision to issue equity.

Baker and Wurgler (2002) find that firms are more likely to issue equity when market values are high relative to book and past market values. Low-leverage firms are those that issue equity after their market-to-book ratios increase, and high-leverage firms issue debt after market-to-book ratios decrease. They also find a persistence effect, in which variations in market-to book ratios have decades-long impacts on capital structure, rather than temporary fluctuations having only temporary effects. These results reject the pecking order and tradeoff hypotheses.

Baker and Wurgler (2002) argue that their evidence supporting the timing hypothesis is most likely due to market inefficiency rather than asymmetric information and offer two reasons. The first is the evidence of the long-run market underreaction (overreaction) to share repurchases. Second, they argue that the strongest support for misvaluation comes from recent surveys of managers themselves. For example, Graham and Harvey (2001) find that two-thirds of CFOs agree with the statement that the amount by which stock is overvalued or undervalued is "an important or very important consideration" in issuing equity. In the Graham and Harvey survey, undervalued common stock is the most important equity issuance factor, and recent stock price performance is the third most popular factor affecting equity issuance decisions. The Pinegar and Wilbricht (1989) survey finds that avoiding mispricing of securities is a factor that governs a manager's financing decisions, but the importance of signaling or correcting the mispricing of securities is relatively low. Kamath's (1997) survey of smaller firms finds that managers do make financing decisions to signal firm valuation, but view past profits and past growth as important determinants of debt ratios. Thus, management appears to change their capital structure when the firm is misvalued.

Korajczyk, Lucas, and McDonald (1992) develop a timing model based on time-varying asymmetric information. In their model, firms choose to issue equity when the market is most informed about the quality of the firm. Asymmetric information is less important. Assuming that managers obtain private information over time, managers will issue equity after credible information releases to the market. After information releases, asymmetric information should be at it's lowest, buffering the negative stock price reaction to equity issues. As time passes, managers receive additional information and the degree of asymmetry increases. Thus, the magnitude of the price decline associated with a stock issue announcement should be positively related to the time between the last information release and the issue. The Korajczyk, Lucas, and McDonald (1992) model predicts an increase in price after a firm withdraws an announced stock issue, as managers will choose not to issue undervalued stock.

Korajczyk, Lucas, and McDonald (1991) find significant negative returns at both the announcement and issue of new stock. The negative impact at stock issues is consistent with the idea that if management perceives the firm to be undervalued at the time of issue, the firm can withdraw an offer up until it is issued. They also find that equity issues tend cluster earlier within a quarter, which is consistent with the release of quarterly earnings announcements, and that issues trail off near the end of the quarter. Also, few firms issue equity prior to the release of their annual report. These results are consistent with the fact that new news mitigates asymmetric information problems.

Korajczyk, Lucas, and McDonald (1991) find that larger firms, which suffer less from asymmetric information, issue equity later. Firms with larger issues relative to firm size, which have greater adverse selection problems, tend to issue equity sooner. Also, the distribution of earnings releases around the equity issue date is not symmetric. Unusually positive and

informative releases precede equity issues in contrast to earnings releases in the years following the issue. Thus, the earnings releases that precede equity issues convey more positive information than earnings releases that follow the issue. The negative announcement effect increases with the length of time between the last information release and the announcement.

Manuel, Brooks, and Schadler (1993) extend the empirical analysis of timing by documenting a relation between the price response to an equity issue and prior dividend and earnings information. Firms that are performing well tend to issue equity shortly after dividend announcements. Poorer performers tend to time equity offers just before a dividend that reveals the poor performance. Bayless and Chaplinsky (1996) also find that equity issues tend to cluster at times when the announcement effect is expected to be the smallest.

6. CONCLUSION

To suggest that asymmetric information is the leading factor in capital structure choice, superseding taxes, financial distress and bankruptcy costs, and agency issues, would spark considerable debate. But the potential for asymmetric information to contribute to our understanding of firms' financing decisions and capital structure choices seems evident.

Among the many empirical results that have emerged from tests of financing decisions, four stand out. First, there is the long-standing result that a firm's stock price declines, on average, in response to a seasoned equity offering. Second, with investment held fixed, announcements of increases (decreases) in leverage result in increase (decreases) in stock price. The results suggest that managers convey information to the market through their financing decisions. Third, the response to the information appears to take considerable time. For example, the stock price reaction to the announcement of an SEO is significantly negative, and the stock price also exhibits abnormal negative long-term returns subsequent to the SEO. Fourth, the

collective results supporting the market timing hypothesis are convincing: equity issues tend to cluster subsequent to earnings announcements and other information releases, and the magnitude of the announcement effects are positively correlated with the length of the intervening time period; SEOs tend to follow periods of high stock returns and their announcements are followed by negative long-term returns; and repurchase announcements are followed by abnormal positive long-term returns.

Beyond these results, there is no definitive empirical support for specific information explanations of capital structure and financing decisions. The most universal cross-sectional implications of the various signaling models have not been borne out by the data. Many models predict that leverage increases along with profitability and value. However, the empirical evidence, although mixed, often suggests just the opposite. These results could simply be a consequence of trying to make the theory work too hard. Signaling models impose homogeneity in capital structure across heterogeneous firms and analyze the changes that different firm types would make in capital structures to signal their types. Thus, a firm's degree of leverage might not convey information about its profitability or its value, even though particular changes in capital structure will. This explanation would reconcile the strong empirical evidence on stock price reactions to leverage-decreasing (increasing) capital structure changes with the strong empirical evidence that firm value and profits are negatively related to leverage. As a practical matter, we would not expect an investor to use the right-hand side of a firm's balance sheet to determine the firm's expected future profits, because there is much more reliable information available. However, that investor would note the information conveyed by a change in the firm's leverage.

In their capital structure review article, Harris and Raviv (1991) conclude that the theoretical research on asymmetric information and capital structure has reached the point of

diminishing marginal returns. However, since that time, there has been much empirical research that has changed the landscape. The data have not provided convincing support for the asymmetric information theories or other theories of capital structure. The gap between the theory and the evidence appears to have widened. The lack of support for the prevailing theories suggests that the theory has lagged behind the empirical findings, and that additional work is needed on both fronts.

The disconnect between capital structure signaling models and financing decisions suggests the need for a more capable asymmetric information theory of financing decisions. The pecking order theory is the only asymmetric information theory of capital structure that consistently receives attention in corporate finance textbooks. However, as we have discussed, the data provide weak support for the pecking order. Moreover, much of the theory developed since the Myers and Majluf (1984) paper illustrates the lack of robustness of the pecking order hypothesis.

Perhaps, the notion that managers attempt to time new issues garners the strongest empirical support. The data are also supported by management surveys indicating that the misvaluation of equity is the most important factor in the decision to issue equity. Unfortunately, the market timing idea has received little theoretical attention. If managers behave opportunistically in their financing decisions, it is reasonable to expect them to behave this way in other situations as well. Managers are responsible for the earnings reports, information releases, and discussions with analysts that determine the information that markets have. A better understanding of managerial incentives to disburse this information, and what effects these incentives have on financing decisions, could provide new insights on capital structure theory.

Because information and financing needs change dramatically over time, a dynamic model of capital structure and financing choices seems appropriate. With few exceptions, asymmetric information capital structure theories are static. A firm's risk exposure also changes over time, and is likely to be asymmetric information. Within this context, analyzing capital structure and financing choices could be enlightening, because debt and equity claims have such different risk characteristics, and because the risk implications of debt and equity are very different for managers than they are for investors.

Empirical tests generally focus on cross-sectional differences between firms in their financing decisions and capital structure. This approach is problematic because of the difficulty in controlling for the great deal of heterogeneity across firms. Longitudinal studies might offer cleaner tests to uncover the factors that determine a firm's capital structure as it changes through time. In addition, tests of asymmetric information theories might require more reliable proxies of the asymmetric information variables, such as growth opportunities, the degree of information asymmetry, and debt capacity.

REFERENCES

Akerlof, G.A., 1970. The market for "lemons": Quality uncertainty and the market mechanism, *Quarterly Journal of Economics* 84, 488-500.

Allen, F. and G.R. Faulhaber, 1989. Signaling by underpricing in the IPO market, *Journal of Financial Economics* 23, 303-324.

Allen, F. and D. Gale, 1988. Optimal security design, *Review of Financial Studies* 1, 229-264.

Allen, F. and D. Gale, 1991. Arbitrage, short sales, and financial innovation, *Econometrica* 59, 1041-1068.

Ambarish, R., K. John, and J. Williams, 1987. Efficient signaling with dividends and investments, *Journal of Finance* 42, 321-343.

Amihud, Y., B. Lev, and N.G. Travlos, 1990. Corporate control and the choice of investment financing: The case of corporate acquisitions, *Journal of Finance* 45, 603-616.

Asquith, P. and D.W. Mullins Jr., 1986. Equity issues and offering dilution, *Journal of Financial Economics* 15, 61-89.

Baker, M. and J. Wurgler, 2002. Market timing and capital structure, *Journal of Finance* 57, 1-32.

Baker, M. and J. Wurgler, 2000. The equity share in new issues and aggregate stock returns, *Journal of Finance* 55, 2219-2257.

Bartov, E., 1991. Open-market stock repurchases as signals for earnings and risk changes, *Journal of Accounting and Economics* 14, 275-294.

Bayless, M. and S. Chaplinsky, 1996. Is there a window of opportunity for seasoned equity issuance? *Journal of Finance* 51, 253-278.

Blazenko, G.W., 1987. Managerial preference, asymmetric information, and financial structure, *Journal of Finance* 42, 839-862.

Boot, A.W. and A.V. Thakor, 1993. Security design, *Journal of Finance* 48, 1349-1378.

Born, J.A. and V.B. McWilliams, 1997. Equity-for-debt exchange offers: Theory, practice, and evidence, *The Financial Review* 32, 273-291.

Bradford, W.D., 1987. The issue decision of manager-owners under information asymmetry, *Journal of Finance* 42, 1245-1260.

Brav, A., C. Geczy, and P.A. Gompers, 2000. Is the abnormal return following equity issuances anomalous? *Journal of Financial Economics* 56, 209-249.

Brennan, M. and A. Kraus, 1987. Efficient financing under information asymmetry, *Journal of Finance* 42, 1225-1243.

Brick, I.E., M. Frierman, and Y. Kim, 1998. Asymmetric information concerning the variance of cash flows: The capital structure choice, *International Economic Review* 39, 745-761.

Brous, P.A., 1992. Commons stock offerings and earnings expectations: A test of the release of unfavorable information, *Journal of Finance* 47, 1517-1536.

Brous, P.A. and O. Kini, 1994. The valuation effects of equity issues and the level of institutional ownership: Evidence from analysts' earnings forecasts, *Financial Management* 23, 1, 33-46.

Brous, P.A., V. Datar, and O. Kini, 2001. Is the market optimistic about the future earnings of seasoned equity offering firms? *Journal of Financial and Quantitative Analysis* 36, 141-168.

Campbell, C.J., L.H. Ederington, and P. Vankudre, 1991. Tax shields, sample-selection bias, and the information content of conversion-forcing bond calls, *Journal of Finance* 46, 1291-1324.

Chan, H., D. Ikenberry, and I. Lee, 2001. Do firms knowingly repurchase stock for good reason? *Working Paper*, National Taiwan University, Rice University, and Korea University.

Chaplinsky, S. and R. Hansen, 1993. Partial anticipation, the flow of information and the economic impact of corporate debt sales, *Review of Financial Studies* 6, 709-732.

Chaplinsky, S., 1993. Do inside ownership and leverage share common determinants? *Quarterly Journal of Business and Economics* 32, 4, 51-65.

Chirinko, R.S. and A.R. Singha, 2000. Testing static tradeoff against pecking order models of capital structure: A critical comment, *Journal of Financial Economics* 58, 417-425.

Choe, H., R. Masulis, and V. Nanda, 1993. Common stock offerings across the business cycle: Theory and evidence, *Journal of Empirical Finance* 1, 1-31.

Clarke, J., C. Dunbar, and K.M. Kahle, 2001. Long-run performance and insider trading in completed and canceled seasoned offerings, *Journal of Financial and Quantitative Analysis* 36, 415-430.

Comment, R. and G.A. Jarrell, 1991. The relative signalling power of Dutch-auction and fixed-price self-tender offers and open market share repurchases, *Journal of Finance* 46, 1243-1271.

Constantinides, G.M. and B.D. Grundy, 1989. Optimal investment with stock repurchase and financing as signals, *Review of Financial Studies* 2, 445-465.

Cooney, J.W. Jr. and A. Kalay, 1993. Positive information from equity issue announcements, *Journal of Financial Economics* 33, 149-172.

Copeland, T.E. and W.H. Lee, 1991. Exchange offers and stock swaps – new evidence, *Financial Management* 20, 3, 34-48.

Cornett, M.M. and N.G. Travlos, 1989. Information effects associated with debt-for-equity and equity-for-debt exchange offers, *Journal of Finance* 44, 451-468.

Daniel, K. and S. Titman, 1995. Financing investment under asymmetric information, in R.A. Jarrow, V. Maskimovic, and W.T. Ziemba, Eds., *Handbooks in OR and MS*, Vol. 9, Elsevier, 721-766.

Dann, L.Y., 1981. Common stock repurchases: An analysis of returns to bondholders and stockholders, *Journal of Financial Economics* 9, 113-138.

Dann, L.Y. and W. Mikkelson, 1984. Convertible debt issuance, capital structure change and financing-related information: Some new evidence, *Journal of Financial Economics* 13, 157-86.

Dann, L.Y., R.W. Masulis, and D. Mayers, 1991. Repurchase tender offers and earnings information, *Journal of Accounting and Economics* 14, 217-251.

Denis, D.J. and A. Sarin, 2001. Is the market surprised by poor earnings realizations following seasoned equity offerings, *Journal of Financial and Quantitative Analysis* 36, 169-193.

Dittmar, A.K., 2002. Why do firms repurchase stock? *Journal of Business*, Forthcoming.

D'Mello, R. and S.P. Ferris, 2000. The information effects of analyst activity at the announcement of new equity issues, *Financial Management* 29, 78-95.

Dybvig, P.H. and J.F. Zender, 1991. Capital structure and dividend irrelevance with asymmetric information, *Review of Financial Studies* 4, 201-219.

Eckbo, B.E., 1986. Valuation effects of corporate debt offerings, *Journal of Financial Economics* 15, 119-151.

Eckbo, B.E. and R.W. Masulis, 1995. R.A. Jarrow, V. Maskimovic, and W.T. Ziemba, Eds., *Handbooks in OR and MS*, Vol. 9, Elsevier, 1017-1072.

Eckbo, B.E., R.W. Masulis, and O. Norli, 2000. Seasoned equity offerings: Resolution of the 'new issues puzzle', *Journal of Financial Economics* 56, 251-291.

Erwin, G.R. and J.M. Miller, 1998. The intra-industry effects of open market share repurchases: Contagion or competitive? *Journal of Financial Research* 21, 389-406.

Fama, E.F., 1998. Market efficiency, long-term returns, and behavioral finance, *Journal of Financial Economics* 49, 283-306.

Fama, E.F. and K.R. French, 2002. Testing trade-off and pecking order predictions about dividends and debt, *Review of Financial Studies* 15, 1-33.

Ferris, S.P. and R. Sant, 1994. Seasoned equity offerings: The case of all-equity firms, *Journal Of Business Finance and Accounting* 21, 3, 429-444.

Frank, M. and V. Goyal, 2000. Testing the pecking order theory of capital structure. *Working Paper*, University of British Columbia and Hong Kong University of Science and Technology.

Franke, G., 1987. Costless signalling in financial markets, *Journal of Finance* 42, 809-822.

Fulghieri, P. and D. Lukin, 2001. Information production, dilution costs, and optimal security design, *Journal of Financial Economics* 61, 3-42.

Giammarino, R.M. and T. Lewis, 1988. A theory of negotiated equity financing, *Review of Financial Studies*, 1, 265-288.

Giammarino, R.M. and E.H. Neave, 1982. The failure of financial contracts and the relevance of financial policy, *Working paper*, Queen's University.

Gorton, G. and G. Pennacchi, 1990. Financial intermediaries and liquidity creation, *Journal of Finance* 45, 49-71.

Graham, J.R. and C.R. Harvey, 2001. The theory and practice of corporate finance: Evidence from the field, *Journal of Financial Economics* 60, 187-243.

Grinblatt, M. and C.Y. Hwang, 1989. Signalling and the pricing of new issues, *Journal of Finance* 44, 393-420.

Grullon, G., 2000. The information content of share repurchase programs. *Working Paper*, Rice University.

Grullon, G. and D. Ikenberry, 2000. What do we know about stock repurchases? *Journal of Applied Corporate Finance* 13, 1, 31-49.

Hansen, R.S. and C. Crutchley, 1990. Corporate earnings and financing: An empirical analysis, *Journal of Business* 63, 347-371.

Hansen, R.S. and A. Sarin, 1999. Are analysts over-optimistic around seasoned equity offerings? *Working Paper*, Tulane University and Santa Clara University.

Harris, M. and A. Raviv, 1991. The theory of capital structure choice, *Journal of Finance* 46, 297-355.

Healy, P.M. and K.G. Palepu, 1990. Earnings and risk changes surrounding primary stock offerings, *Journal of Accounting Research* 28, 25-48.

Heinkel, R., 1982. A theory of capital structure relevance under imperfect information, *Journal of Finance* 37, 1141-1150.

Heinkel R. and J. Zechner, 1990. The role of debt and preferred stock as a solution to adverse investment incentives, *Journal of Financial and Quantitative Analysis* 25, 1-24.

Helwege, J. and N. Liang, 1996. Is there a pecking order? Evidence from a panel of IPO firms, *Journal of Financial Economics* 40, 429-458.

Hertzel, M. and P.C. Jain, 1991. Earnings and risk changes around stock repurchase tender offers, *Journal of Accounting and Economics* 14, 253-274.

Hovakimian, A., T. Opler, and S. Titman, 2001. The debt-equity choice, *Journal of Financial and Quantitative Analysis* 36, 1-24.

Howe, K.M., J. He, and G.W. Kao, 1992. One-time cash flow announcements and free cash-flow theory: Share repurchases and special dividends, *Journal of Finance* 47, 1963-1975.

Howton, S.D., S.W. Howton, and S.B. Perfect, 1998. The market reaction to straight debt issues: The effects of free cash flow, *Journal of Financial Research* 21, 219-228.

Ikenberry, D.L., J. Lakonishok, and T. Vermaelen, 1995. Market underreaction to open market share repurchases, *Journal of Financial Economics* 39, 181-208.

Ikenberry, D.L. and T. Vermaelen, 1996. The option to repurchase stock, *Financial Management* 25, 4, 9-24.

Israel, R., A.R. Ofer, and D.R. Siegel, 1989. The information content of equity-for-debt swaps: An investigation of analyst forecasts of firm cash flows, *Journal of Financial Economics* 25, 349-370.

Jagadeesh, N., 2000. Long-term performance of seasoned equity offerings: benchmark errors and biases in expectations, *Financial Management*, 29, 3, 5-30.

Jagannathan, M. and C. Stephens, 2001. Motives for multiple open-market repurchase programs. *Working Paper*, Binghamton University - State University of New York and University of Missouri at Columbia.

Jain, P.C., 1992. Equity issues and changes in expectations of earnings by financial analysts, *Review of Financial Studies* 5, 669-683.

Jindra, J., 2001. Seasoned equity offerings, valuation, and timing. *Working Paper*, Cornerstone Research.

John, K., 1987. Risk-shifting incentives and signaling through corporate capital structure, *Journal of Finance* 42, 623-641.

John, K. and J. Williams, 1985. Dividends, dilution, and taxes: A signalling equilibrium, *Journal of Finance* 40, 1053-1070.

Johnson, S.A., 1995. Dividend payout and the valuation effects of bond announcements, *Journal of Financial and Quantitative Analysis* 30, 407-423.

Jung, K., Y-C. Kim, and R.M. Stulz, 1996. Timing, investment opportunities, managerial discretion, and the security issue decision, *Journal of Financial Economics* 42, 159-185.

Kalay, A. and A. Shimrat, 1987. Firm value and seasoned equity issues: price pressure, wealth redistribution, or negative information, *Journal of Financial Economics* 19, 109-126.

Kamath, R., 1997. Long-term financing decisions: Views and practices of financial managers of NYSE firms, *The Financial Review* 32, 331-356.

Korajczyk, R.A., D.J. Lucas, and R.L. McDonald, 1991. The effect of information releases on the pricing and timing of equity issues, *Review of Financial Studies* 4, 685-708.

Korajczyk, R.A, D.J. Lucas, and R.L. McDonald, 1992. Equity issues with time varying asymmetric information, *Journal of Financial and Quantitative Analysis* 27, 397-417.

Krasker, W.S., 1986. Stock price movements in response to stock issues under asymmetric information, *Journal of Finance* 41, 93-105.

Lakonishok, J. and T. Vermaelen, 1990. Anomalous price behavior around repurchase tender offers, *Journal of Finance* 45, 455-477.

Lease, R.C., R.W. Masulis, and J.R. Page, 1991. An investigation of market microstructure impacts on event study returns, *Journal of Finance* 46, 1523-1536.

Leland, H.E. and D.H. Pyle, 1977. Information asymmetries, financial structure, and financial intermediation, *Journal of Finance* 32, 371-378.

Lie, E. and J.J. McConnell, 1998. Earnings signals in fixed-price and Dutch auction self-tender offers, *Journal of Financial Economics* 49, 161-186.

Lie, E., Lie, H., and J.J. McConnell, 2001. Debt-reducing exchange offers, *Journal of Corporate Finance* 7, 179-207.

Loughran, T. and J.R. Ritter, 1995. The new issues puzzle, *Journal of Finance* 50, 23-51.

Loughran, T. and J.R. Ritter, 1997. The operating performance of firms conducting seasoned equity offerings, *Journal of Finance* 52, 1823-1850.

Loughran, T. and J.R. Ritter, 2000. Uniformly least powerful tests of market efficiency, *Journal of Financial Economics* 55, 361-389.

Lucas, D.J. and R.L. McDonald, 1990. Equity issues and stock price dynamics, *Journal of Finance* 45, 1019-1043.

McLaughlin, R., A. Safieddine, and G.K. Vasudevan, 1996. The operating performance of seasoned equity issuers: Free cash flow and post-issue performance, *Financial Management* 25, 4, 41-53.

McLaughlin, R., A. Safieddine, and G.K. Vasudevan, 1998. The information content of corporate offerings of seasoned securities: An empirical analysis, *Financial Management* 27, 2, 31-45.

McNally, W.J., 1999. Open market stock repurchase signaling, *Financial Management* 28, 2, 55-67.

Manuel, T.A., L.D. Brooks, and F.P. Schadler, 1993. Common stock price effects of security issues conditioned by current earnings and dividend announcements, *Journal of Business* 66, 571-593.

Marsh, P., 1982. The choice between equity and debt: An empirical study, *Journal of Finance* 37, 121-144.

Masulis, R.W., 1980. The effects of capital structure changes on security prices: A study of exchange offers, *Journal of Financial Economics* 8, 139-178.

Masulis, R.W., 1983. The impact of capital structure change on firm value: Some estimates, *Journal of Finance* 38, 107-126.

Masulis, R.W., 1988. *The Debt-Equity Choice* (Ballinger Press, Cambridge, MA).

Masulis, R.W. and A.N. Korwar, 1986. Seasoned equity offerings: An empirical investigation, *Journal of Financial Economics* 15, 91-118.

Maxwell, W. and C. Stephens, 2001. The wealth effects of repurchases on bondholders. *Working Paper*, Texas Tech University and University of Missouri at Columbia.

Mikkelson, W.H. and M.M. Partch, 1986. Valuation effects of security offerings and the issuance process, *Journal of Financial Economics* 15, 31-60.

Miller, M.H. and K. Rock, 1995. Dividend policy under asymmetric information, *Journal of Finance* 40, 1031-1051.

Modigliani, F. and M. Miller, 1958. The cost of capital, corporation finance, and the theory of investment, *American Economic Review* 48, 261-297.

Myers, S. C., 1977. Determinants of corporate borrowing, *Journal of Financial Economics* 5, 147-176.

Myers, S. C., 1984. The capital structure puzzle, *Journal of Finance* 39, 575-592.

Myers S. C. and N. S. Majluf, 1984. Corporate financing and investment decisions when firms have information that investors do not have, *Journal of Financial Economics* 13, 187-221.

Nachman, D.C. and T.H. Noe, 1994. Optimal design of securities under asymmetric information, *Review of Financial Studies* 7, 1-44.

Narayanan, M.P., 1988. Debt versus equity under asymmetric information, *Journal of Financial and Quantitative Analysis* 23, 39-51.

Noe, T.H., 1988. Capital structure and signaling game equilibria, *Review of Financial Studies* 1, 331-355.

Noe, T.H. and M.J. Rebello, 1996. Asymmetric information, managerial opportunism, financing, and payout policies, *Journal of Finance* 51, 637-660.

Nohel, T. and V. Tarhan, 1998. Share repurchases and firm performance: New evidence on the agency costs of free cash flow, *Journal of Financial Economics* 49, 187-222.

Persons, J.C., 1994. Signaling and takeover deterrence with stock repurchases: Dutch auctions versus fixed price tender offers, *Journal of Finance* 49, 1373-1402.

Persons, J.C., 1997. Heterogeneous shareholders and signaling with share repurchases, *Journal of Corporate Finance* 3, 221-249.

Pinegar, M. and R. Lease, 1986. The impact of preferred-for-common exchange offers on firm value, *Journal of Finance* 41, 795-814.

Pinegar, M.J. and L.C. Wilbricht, 1989. What managers think of capital structure theory: A survey, *Financial Management* 18, 4, 82-91.

Rajan, R.G. and L. Zingales, 1995. What do we know about capital structure? Some evidence from international data, *Journal of Finance* 50, 1421-1460.

Rangan, S., 1998. Earnings management and the performance of seasoned equity offerings, *Journal of Financial Economics* 50, 101-122.

Ravid, A.S. and O.H. Sarig, 1991. Financial signalling by committing to cash outflows, *Journal of Financial and Quantitative Analysis* 26, 165-180.

Riley, J.G., 2001. Silver signals: Twenty-five years of screening and signaling, *Journal of Economic Literature* 39, 432-478.

Rothschild, M. and J. Stiglitz, 1976. Equilibrium in Competitive Insurance Markets: The economics of markets with imperfect information, *Quarterly Journal of Economics* 90, 629-650.

Ross, S.A., 1977. The determination of financial structure: The incentive signaling approach, *Bell Journal of Economics* 8, 23-40.

Schipper, K. and A. Smith, 1986. A comparison of equity carve-outs and seasoned equity offerings: Share price effects and corporate restructuring, *Journal of Financial Economics* 15, 153-86.

Shah, K., 1994. The nature of information conveyed by pure capital structure changes, *Journal of Financial Economics* 36, 89-126.

Shivakumar, L., 2000. Do firms mislead investors by overstating earnings before seasoned equity offerings? *Journal of Accounting and Economics* 29, 339-370.

Shyam-Sunder, L., 1991. The stock price effect of risky versus safe debt, *Journal of Financial and Quantitative Analysis* 26, 549-558.

Shyam-Sunder, L. and S.C. Myers, 1999. Testing static tradeoff against pecking order models of capital structure, *Journal of Financial Economics* 51, 219-244.

Smith, C.W. Jr., 1986. Investment banking and the capital acquisition process, *Journal of Financial Economics* 15, 3-29.

Speiss, D.K. and J. Affleck-Graves, 1995. Underperformance of long-run returns following seasoned equity offerings, *Journal of Financial Economics* 38, 243-267.

Speiss, D.K. and J. Affleck-Graves, 1999. The long-run performance of stock returns following debt offerings, *Journal of Financial Economics* 54, 45-73.

Spence, M., 1973. Job market signalling, *Quarterly Journal of Economics* 87, 355-374.

Stiglitz, J.E., 1969. A Re-examination of the Modigliani-Miller theorem, *American Economic Review* 59, 784-793.

Stiglitz, J.E., 1974. On the irrelevance of corporate financial policy, *American Economic Review* 64, 851-866.

Taggart, R.A. Jr., 1977. A model of corporate financing decisions, *Journal of Finance* 32, 1467-1484.

Teoh, S.H., I. Welch, and T.J. Wong, 1998. Earnings management and the underperformance of seasoned equity offerings, *Journal of Financial Economics* 50, 63-99.

Teoh, S.H. and T.J. Wong, 2002. Why new issues and high-accrual firms underperform: The role of analysts' credulity, *Review of Financial Studies*, Forthcoming.

Titman, S. and R. Wessels, 1988. The determinants of capital structure choice, *Journal of Finance* 43, 1-19.

Vermaelen, T., 1981. Common stock repurchases and market signalling: An empirical study, *Journal of Financial Economics* 9, 139-183.

Vermaelen, T., 1984. Repurchase tender offers, signalling, and managerial incentives, *Journal of Financial and Quantitative Analysis* 19, 163-184.

Viswanath, P.V., 1993. Strategic considerations, the pecking order hypothesis, and market reactions to equity financing, *Journal of Financial and Quantitative Analysis* 28, 213-234.

Welch, I., 1989. Seasoned offerings, imitation costs, and the underpricing of initial public offerings, *Journal of Finance* 44, 421-449.