The Pecking Order, Trade-off, Signaling, and Market-Timing Theories of Capital Structure: a Review

Miglo, Anton

University of Bridgeport

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Anton Miglo

Associate professor, University of Bridgeport, School of Business, Bridgeport, CT 06604, phone (203) 576-4366, email: amiglo@bridgeport.edu.

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Abstract. This paper surveys 4 major capital structure theories: trade-off, pecking order, signaling and market timing. For each theory, a basic model and its major implications are presented. These implications are compared to the available evidence. This is followed by an overview of pros and cons for each theory. A discussion of major recent papers and suggestions for future research are provided.

Introduction

The modern theory of capital structure began with the famous proposition of Modigliani and Miller (1958) that described the conditions of capital structure irrelevance. Since then, many economists have been changing these conditions to explain factors driving capital structure decisions. Harris and Raviv (1991) synthesized major theoretical literature in the field, related these to the known empirical evidence, and suggested promising avenues for future research. They argued that asymmetric information theories of capital structure are less promising than control-based or product-based theories. The financial crisis of 2008-2009 forces to look critically at the modern level of capital structure theory. The problems of many companies were related to their financing policies. The role of asymmetric information and

agency problems has to be understood better. The market for mortgage-backed securities which many believe was in the core of financial crisis was full of asymmetric information between investors and issuers. Numerous scandals including the Bernie Madoff's one illustrate the depth of agency problems in finance. At the same time, old ideas about the link between taxes, bankruptcy costs and capital structure were not receiving enough attention in theoretical literature until recently while managers' surveys systematically reveal their practical importance.

This paper surveys 4 major capital structure theories: trade-off, pecking order, signaling and market timing. These theories are directly related to asymmetric information, agency problems, taxes and bankruptcy costs. After presenting the basic model and basic ideas of each theory we discuss their consistency with observed evidence. We also discuss the main directions of current and future research on capital structure.

Briefly, our conclusions are as follows. First, for the last 20 years the trade-off theory and pecking-order theory have been extensively tested. This research revealed an incredible complexity of explaining firms' behavior by using either theory. Taking separately they are not able to explain some important facts about capital structure. The marginal productivity of this research can be diminished in the future without significant advances in developing new more powerful theoretical models. These can be either dynamic versions of trade-off or pecking-order theory or models combining both those theories. Secondly, after the publication of Baker and Wurgler (2002) the market timing theory had emerged from a relatively "small" argument in the end of 1980s beginning 1990s as a separate popular theory of capital structure. Compared to pecking-order and trade-off theory the theoretical part of this theory is underdeveloped. Thirdly a very popular line of research has emerged which focuses on entrepreneurs' surveys about real capital structure decisions. Graham and Harvey (2001) found that an immense gap exists between theory and practice. Further surveys can contribute to monitoring this gap and its reduction in the future. Forth, signaling theory of capital structure does not have empirical support regarding some of its core predictions. However, several new directions have emerged

opposite to traditional idea of signaling quality through debt issuance. It seems though that more effort is required here in order to create new models which can be considered as comparable to either pecking order or trade-off theory.

TRADE-OFF THEORY

Basic model, major results and evidence

Kraus and Litzenberger (1973) suggest that capital structure reflects a trade-off between the tax benefits of debt and the expected costs of bankruptcy. Consider a firm that generates a random cash flow R that is uniformly distributed between 0 and $\bar{R}$. The firm faces a constant tax rate T on corporate income. If the earnings are not enough to cover the promised debt payment D, there is a deadweight loss of kR that is used up in the process. This can include direct bankruptcy costs such as fees paid to lawyers, and indirect bankruptcy costs such as losses due to general lack of confidence in the firm from its customers. If earnings are large enough $(R > D)$ equityholders receive $(R - D)(1 - T)$. Otherwise, they receive nothing. The market value of debt V_D equals $\frac{\bar{R}-D}{\bar{R}}D + \frac{D}{\bar{R}}\frac{D(1-k)}{2}$. Here $\frac{\bar{R}-D}{\bar{R}}$ is the probability that $R \geq D$ and $\frac{D}{\bar{R}}$ is the probability of default. If $R > D$ the creditors receive D and they receive on average $\frac{D(1-k)}{2}$ if the firm defaults. The market value of equity V_E equals $\frac{\bar{R}-D}{\bar{R}}\left(\frac{\bar{R}+D}{2} - D\right)(1 - T)$. The firm's value V equals

$$V_D + V_E = \frac{\bar{R}-D}{\bar{R}}D + \frac{D}{\bar{R}}\frac{D(1-k)}{2} + \frac{\bar{R}-D}{\bar{R}}\left(\frac{\bar{R}+D}{2} - D\right)(1 - T) \quad (1)$$

The firm's choice of leverage is determined by maximizing V. The first-order condition with respect to D is

$$D = \frac{T\bar{R}}{T+1-k} \quad (2)$$

Expected bankruptcy costs and debt

If k is higher in (2) the equilibrium level of D should be lower. Higher the expected bankruptcy costs are, the more advantages are for equity. This result has several interpretations. Large firms should have more debt since larger firms are more diversified and have lower default risk. Tangible assets suffer a smaller loss of value when firms go into distress. Hence, firms with more tangible assets, for example airplanes manufacturers, should have higher leverage in comparison to companies that have more intangible assets such as research firms. Growth firms lose more of their value when they go into distress. Thus the theory predicts a negative relation between leverage and growth. Empirical studies generally support the above predictions (Rajan and Zingales (1995), Barclay et al. (2006), Frank and Goyal (2007)).

Taxes and debt

When T increases in (2), D should increase. The higher taxes are, the greater the tax advantage of debt will be. Hence, firms with higher tax rates should have higher debt ratios compared to firms with lower tax rates. Inversely, firms that have substantial non-debt tax shields, such as depreciation, should be less likely to use debt than firms that do not have these tax shields. If tax rates increase over time, we would expect debt ratios to go up over time. Debt ratios in countries where debt has a much larger tax benefit should be higher than debt ratios in countries whose debt has a lower tax benefit. The evidence is mixed. Graham (1996) finds some support for tax factor. Titman and Wessels (1988) find that non-debt tax shields and the use of debt are positively correlated. Wright (2004) finds that leverage in corporate sector is remarkably stable between 1900 and 2002 despite large difference in tax rates. A survey of 392 CFOs by Graham and Harvey (2001) found that 45% surveyed agreed that tax considerations played an important role in their capital structure choices.

Debt and profitability

As follows from (2), if $\bar{R}$ increases D should increase too. Thus more profitable firms should

have more debt. Expected bankruptcy costs are lower and interest tax shields are more valuable for profitable firms. The empirical studies typically find a negative relation between profitability and leverage (Titman and Wessels (1988), Rajan and Zingales (1995), Fama and French (2002) and Frank and Goyal (2007)).

Debt conservatism

The trade-off theory predicts that the marginal tax benefit of debt should be equal to marginal expected bankruptcy cost. The evidence about this is mixed. Some researchers argue that the former is greater than the latter because direct bankruptcy costs are very small and that the level of debt is below optimal (Miller (1977), Graham (2000)). Other research find that indirect bankruptcy costs can total up to 25-30% of assets value and is thus comparable with tax benefits of debt (Molina (2005) and Almeida and Philippon (2007)). In addition, tax advantage of debt can be reduced if one includes personal taxation in the basic model (Green and Hollifield (2003), Gordon and Lee (2007)). The reason is that tax rates on the return from equity such as dividends or capital gain are often reduced.

Target debt level

Debt changes should be dictated by the difference between current level and (2) (*mean reversion*). The evidence usually confirms mean reversion (Fama and French (2002), Kayan and Titman (2007)). Different opinions exist regarding the speed of adjustments. Some papers find that adjustments are too slow (Fama and French, 2002). Others argue that large capital structure adjustments are costly. Firms may exhibit *target adjustment behavior* if deviations from that target are gradually removed over time (Leary and Roberts, 2005).

Including agency costs in the basic framework

Agency costs arise because managers do not necessarily act in the best interests of shareholders and shareholders do not necessarily act in the best interests of creditors. Including agency costs in the basic model can help to explain some of the problems of trade-off theory discussed above, for example *debt conservatism*. If an investment yields large returns

equityholders capture most of the gain. If, however, the investment fails, debtholders bear the consequences. As a result, equityholders may benefit from investing in very risky projects, even if they are value-decreasing ("asset substitution effect", Jensen and Meckling, 1976). Debtholders can correctly anticipate equityholders' future behavior. This leads to a decrease in the value of debt and reduces the incentive to issue debt. Myers (1977) observes that when firms are likely to go bankrupt in the near future, equityholders may have no incentive to contribute new capital to invest in value-increasing projects. The reason is that equityholders bear the entire cost of the investment, but the returns from the investment may be captured mainly by the debtholders ("debt overhang").

On the other hand some agency theories favor higher debt. For example, Jensen (1986) argues that debt improves the discipline of an entrenched manager and Jensen and Meckling (1976) argue that choosing debt instead of equity allows keeping the insiders' fraction of equity high and thus improves their incentive to work in the interests of shareholders. Malmendier et al. (2005) and Hackbarth (2008) present behavioral models in which an overconfident manager chooses higher debt levels than does a rational manager. The overall effect of agency problems on debt level is difficult to quantify. Also the general importance of asset substitution problem is under debate (Parrino and Weisbach, 1999). In their survey of CFOs Graham and Harvey (2001) find this problem unimportant.

The above analysis leads to the following. Firstly, empirical evidence usually confirms that the *leverage should be inversely related to the expected bankruptcy costs* and that *firms adjust their capital structures towards target ratios*. Secondly, a mixed evidence exists regarding *how important is tax factor for capital structure and how sensitive is capital structure to tax changes*. The evidence is also ambiguous about whether or not *firms' leverage is too low* and whether or not *firms move towards their target ratios fast enough*. Thirdly, *negative correlation between debt and profitability* does not support the theory.

Dynamic extensions

In a dynamic setting of particular importance are retained earnings and transaction costs which were ignored in the basic model. For example, profitable firms may prefer to retain earnings to reduce the cost of raising funds in the future. This may lead to lower leverage as compared to static theory. Consider a two-period model where in period 1 after earnings R_1 are known a firm must determine the amount of dividends d and retained earnings $I = R_1 - d$. This decision is assumed to be taken simultaneously with financing structure for period 2 investment project that costs c. $c = I + D + E$, where D and E denote debt and equity. The project generates earnings R_2. The firm faces costs $z(D + E)$ when raising external funds. Throughout the paper we assume for simplicity that investors are risk-neutral and the risk-free interest rate equals 0. The initial shareholders' payoff V equals the sum of first and second-period dividends $d + (1-\propto)(R_2 - D - z(D + E))(1 - T)$, where $\propto$ is the fraction equity required by investors: $\propto \big(R_2 - D - z(D + E)\big)(1 - T) = E$. The investors' earnings should cover the amount of investments. V can thus be written as $\big(R_2 - D - z(b - R_1 + d)\big)(1 - T) - c + R_1 + D$. The derivative of V with respect to d is $-z(1 - T) < 0$ and the derivative of V with respect to D is $T > 0$. This implies a "corner" solution. Comparing the strategy $d = 0$ with $D = c$ we find that the former is better if z is sufficiently high.

Hence a firm with high profit in period 1 should use retained earnings to finance period 2 investments. A firm with low profit that does not have sufficient funds to finance the project internally will use debt. This leads to a situation where low-profit firms have more debt than high-profit firms (negative correlation between debt and profitability). This also contributes to the debt conservatism discussion since high-profit firms will have the debt level below prescribed by (2). Note that if one adds bankruptcy costs in the model, the results will not change: high-profit firm will not use debt although the level of debt for low-profit firm will be reduced.

Similar ideas have been addressed in several recent papers. Hennessy and Whited (2005) analyze a model with equity flotation costs and show that under some plausible values of parameters one can observe the negative correlation between debt and profitability. Ju et al. (2005) provides estimates of optimal capital structures based on a calibrated contingent-claims model where long-term creditors can force bankruptcy if the firm's value is too low. They show that firms are not underlevered relative to the predictions of their model. Strebulaev (2007) analyzes the model where firms in distress have to sell their assets with discount and shows that debt level is below than one predicted by the static models. In Tserlukevich (2008) model, investments are irreversible and there is "fixed investment cost" which depends on the existing stock of capital. The model is able to replicate negative relation between leverage and profitability. Morellec (2004) analyzes a contingent claims model with manager-stockholder conflicts. The model can generate low debt ratios. Titman and Tsyplakov (2007) consider a model where the firm can maximize the equity value or the claimholders value depending on whether contracts can be costlessly written or not. The model can explain slow adjustment towards the target debt level.

Dynamic trade-off models are likely to provide significant contribution to the trade-off theory. It seems though that empirical results and simulated results dominate theoretical results. New theoretical results are expected.

PECKING-ORDER THEORY (POT)

The basic model, major results and evidence

Information asymmetries exist in almost every facet of corporate finance and they significantly complicate the managers' ability to maximize firm values. It can be challenging for good quality firms insiders to convince investors directly about the true quality of their firm especially if this concerns future performance. As a result, the investors will try to incorporate indirect evidence

in their valuation of firm's performance, which is done through the analysis of information-revealing actions. Capital structure choice is often considered under this angle.

Consider a firm that is raising funds for an investment project. The investment cost is c. There are two types of firm. For type g, the project brings cash flow θ_g and for type b it is θ_b, $\theta_g > \theta_b$. The fraction of type g firms is f. The initial capital structure is 100% equity with n shares outstanding. The firm's managers know the firm's type which is not publicly available. The managers maximize the wealth of the initial shareholder(s). The firm has internal funds $I, I > c$. To finance the project the firm may use internal funds or issue equity.

Pecking order

If g decides to use internal funds, the shareholders' profit is

$$\theta_g + I - c \tag{3}$$

If, on the other hand, g were to issue equity, it would be mimicked by b, since the value of shares issued by g will be greater than that of b. The shares of g will be mispriced. More specifically, investors will require a fraction of equity $\propto$ such that $\propto \left(I + f\theta_g + (1-f)\theta_b\right) = c$. This means that the profit of initial shareholders for g is

$$(1-\propto)\left(I + \theta_g\right) = \left(1 - \frac{c}{I + f\theta_g + (1-f)\theta_b}\right)\left(I + \theta_g\right) = I + \theta_{gh} - \frac{c\left(I+\theta_g\right)}{I + f\theta_g + (1-f)\theta_b} \tag{4}$$

that is less than (3) because $\theta_g > \theta_b$. Therefore g should use internal funds to finance the project. In this case b is indifferent between internal funds and equity. In either case the shareholders' payoff for type b is $\theta_b + I - c$.

Equity is dominated by internal funds in this model. Low-quality firms will use equity as much as internal funds but high-quality firms will prefer internal funds. Similarly equity is dominated by debt. Suppose that the firm can finance the project with risk-free debt. Then g can issue debt to avoid any mispricing. If debt issued by the firm is risky the things do not change much. One can show that debt suffers from misvaluation less than equity. The same holds if the firm has

available assets-in-place. Hence a "pecking-order" emerges: internal funds, debt, and equity (Myers and Majluf, 1984).

The empirical evidence is mixed. Shyam-Sunder and Myers (1999), Lemmon and Zender (2007) and a survey of NYSE firms by Kamath (1997) find support for pecking order while Chirinko and Singha (2000) and Leary and Roberts (2010) do not. Frank and Goyal (2003) show that greatest support for pecking order is found among large firms.

Securities price reaction to equity issues announcements

After the market learns that the firm has a valuable investment project (but before the financing decision is taken) the true value of g is $\theta_g + I - c$ and the true value of b is $\theta_b + I - c$. Thus the share price is $\frac{f(I+\theta_g-c)+(1-f)(I+\theta_b-c)}{n}$. However after the issue is announced the share price is $\frac{I+\theta_g-c}{n}$. The share price has decreased since investors have figured out that the issuer's type is b. The announcement of issuing stock drives down the stock price. Also since debt is less sensitive to mispricing problem than equity, the model predicts better market reaction on debt issues than equity issues.

Empirically it is observed that the announcements of equity issues result in significant negative stock price reactions (Masulis and Korwar (1986), Antweiler and Frank (2006)). Announcements of debt issues generate weak market reaction on average (Eckbo (1986) and Antweiler and Frank (2006)).

Negative correlation between debt and profitability

Good-quality firms use internal funds for financing as much as possible. Since low-quality firms do not have as much profits and retained earnings as high-quality firms they have to use external sources more frequently and it will usually be debt. This explains the puzzle about the negative correlation between debt and profitability that we discussed in the previous chapter.

The extent of asymmetric information and pecking order

The model predicts that higher extent of asymmetric information reduces the incentive to issue equity. For example, if in the basic model $\theta_g = \theta_b$, firms can issue equity without risks of being misvalued. Also in this case there is no negative reaction to equity issues announcements.

The evidence is ambiguous. D'Mello and Ferris (2000) and Baghart, Pasquariello and Wu (2008) support this prediction. Choe, Masulis and Nanda (1993) find that equity issues are more frequent when economy is doing well and information asymmetry is low. On the other hand the greatest support for pecking order is found among large firms (Frank and Goyal, 2003), which are expected to face the least severe adverse selection problem since they receive better coverage by equity analysts.

The evidence supports such predictions of POT as *negative correlation between debt and profitability*, *negative share price reaction on equity issue announcements* and *better share price reaction on debt issues than on equity issues*. The evidence is mixed about whether or not firms follow *pecking order hierarchy* and whether or not *the extent of asymmetric information reduces the incentive to issue equity*.

Extensions with different types of asymmetric information

A rich set of new predictions can arise when one analyzes an environment with staged investments where private information is long-term in contrast to standard models where insiders receive private information one period before the market. Halov (2006) proposes a model that considers a firm without internal funds where the choice of security depends not only on the current adverse selection cost of the security but also on the future information environment and future needs of financing of the firm. Debt issues today make future security issues more sensitive to the degree of asymmetric information in the issuance period. Halov finds that future adverse selection costs affect negatively the debt component of new external financing and positively the cash reserves of the firm. The paper explains why companies may prefer equity to debt and provides an idea about why the incentive for issuing equity depends

not only on the extent of asymmetric information in current period but also in future periods.

Miglo (2009) considers a firm with a two-stage investment project. Asymmetric information exists regarding both firms' quality and their growth potential. It is shown that if the extent of asymmetric information regarding quality is high compared to that about growth, an equilibrium where high-quality firms issue equity does not exist that is consistent with POT. If the extent of asymmetric information regarding quality is small enough while that regarding growth is high enough, the firms' behavior will differ from what is predicted by POT. These results can help to explain why firms in growing industries do not follow POT. These industries are characterized by the high degree of uncertainty about the rates of growth.

Another idea is to use asymmetric information about risk. Consider the basic model where investment projects are risky and the firm types differ not only in the probability of project's success but also in the amount of profit generated in the case of success. There are two types of firm. For type g, the project brings cash flow g_h if successful and g_l otherwise. The probability of success is θ_g. The same parameters for type b are b_h, b_l and θ_b. Assume $g_h > b_h$. There are no internal funds available. To see why both debt and equity can be issued by high-quality type, consider two situations. First suppose that $\theta_g = \theta_b$ (firms have the same risk and thus there is no asymmetric information concerning risk) and $g_l > b_l$. Halov and Heider (2006) show that the mispricing of equity issued by g (high-quality type) will be greater than that of debt. Thus g would prefer debt to equity that is consistent with POT. Second case is when

$$g_h\,\theta_g + b_h(1-\theta_g) = g_l\theta_b + b_l(1-\theta_b) = m$$

(Firms have the same average value so there is no asymmetric information about the firm's value). In this case firms can issue equity that will have the same value for each type avoiding mispricing. For both firms types insiders will require a fraction of equity $\propto$ such that $\propto m = c$.

Halov and Heider (2006) predict that a firm should issue more equity and less debt if risk plays a larger role the adverse selection problem of external financing. This helps to explain why large

mature firms issue debt and young small firms issue equity. An outside investor presumably knows less about the risk of an investment if he faces a young small non-dividend paying firm than if he faces a large mature dividend paying firm.

We feel that models with different kinds of asymmetric information have future potential especially dynamic models.

SIGNALLING

Basic model, major predictions and evidence

In the pecking order model good quality firms had to use internal funds to avoid adverse selection problem and value loss. These firms were not able to signal its quality by using capital structure. We turn now to models in which capital structure serves as a signal of private information (Ross, 1977).

Consider a firm that is raising funds for an investment project. The investment cost is c. The project brings cash flow H if successful and 0 otherwise, $H > c$. There are two types of firm. For type g, the probability of success is 1 and for type b it is θ_b , $1 > \theta_b$. The fraction of high-quality firms is f. The initial capital structure is 100% equity with n shares outstanding. To finance the project, the firm can issue either debt or equity. The firm's manager knows the firm's type which is not publicly available. The manager's objective function is $aR - (1 - a)K$. It means that the manager chooses the capital structure to maximize a weighted average of the shareholders payoff R net of a penalty K for bankruptcy. Higher is a, higher is the weight of shareholders' payoff in the manager's objective function. An example of penalty for bankruptcy is loss of reputation. If g were to issue equity it would be mimicked by b. The manager of b benefits from getting higher price of shares without taking any risk of bankruptcy. Then the shares of g are undervalued. Consider if g could signal its type by issuing debt. Suppose g issues debt with a face value c. If b would issue debt the expected value of manager's objective

function is $a\theta_b(H-c)-(1-a)(1-\theta_b)K$. If b would issue equity then it is $a(\theta_b H-c)$. The manager issues equity if $a(\theta_b H-c)>a\theta_b(H-c)-(1-a)(1-\theta_b)K$. This can be simplified to:

$$(1-a)K>ac \tag{5}$$

This means that if bankruptcy penalty is high enough, a signaling equilibrium is possible where g issues debt and b issues equity.

Share price reaction and securities issues

After the market learns that the firm has a valuable investment project (in case when signaling equilibrium exists) the true value of g is $H-c$ and the true value of b is $\theta_b H-c$. Thus the share price is $\frac{fH+(1-f)\theta_b H-c}{n}$. However after the debt issue is announced the share price is $\frac{H-c}{n}$. The share price has increased since investors have figured out that the issuer is type is g. Thus the market reaction on debt issues (more generally, on leverage-increasing transactions, such as issuing convertible debt, repurchasing shares, debt for equity swaps etc.) is positive. Similarly the market reaction on equity issues (or leverage-decreasing transactions) is negative. The same results were obtained by using managerial risk-aversion instead of bankruptcy penalty (Leland-Pyle, 1977).

Negative share price reaction on the announcement of equity issues is usually consistent with empirical evidence as we discussed in previous section (similar for leverage-decreasing transactions). The evidence about positive market reaction on leverage-increasing transactions except debt issues is also quite supportive signaling theory (see Masulis (1980), Antweiler and Frank (2006) and an entrepreneurs' survey by Baker et al (2003)).

The evidence on announcement of debt issues does not support signaling theories. Eckbo (1986) and Antweiler and Frank (2006) find insignificant changes in stock prices in response to straight corporate debt issues.

Firm's performance and securities issues

If a separating equilibrium exists, high-quality firms issue debt and low-quality firms issue

equity. The empirical prediction is that firm value (or profitability) and the debt-equity ratio is positively related. The evidence is ambiguous. Most empirical studies report a negative relation between leverage and profitability as we discussed earlier. In a similar spirit some studies document the superior absolute performance of equity issuing firms before the issue and immediately after the issue (Jain and Kini (1994), Loughran and Ritter (1997)). On the other hand, several studies examine long-term firm performance subsequent to capital structure changes. Shah (1994) report that *business risk* dropped (rose) after leverage-increasing (decreasing) exchange offers. The long run operating underperformance of equity issuing firms compared to non-issuing firms has been documented (Jain and Kini (1994), Mikkelson et al. (1997) and Loughran and Ritter (1997)).

The empirical evidence supports such predictions of signaling theory as *negative market reaction on leverage-decreasing transactions and positive reaction on leverage-increasing transactions (excluding debt issues)*. The evidence is not supportive regarding *market reaction to debt issues* and *negative correlation between debt and profitability*. Also how to explain that shortly after the issue firms issuing equity have better operating performance than non-issuing firms and in the long run they tend to underperform those firms? Many ideas have been developed to explain why high-profit firms may use equity as a signal. These include signaling low variance of earnings, signaling medium-level earnings in the model with 3 types of firms, signaling in a model that combines asymmetric information with agency problems (Brick, Frierman and Kim (1998), Noe (1988), Noe and Rebello (1996)) etc. A challenge for researchers today is to find a model which will be able to explain several major empirical phenomena simultaneously. From our prospective, two directions can be considered as most prominent: dynamic extensions of signaling models and security design models.

Dynamic extensions

Dynamic models allow focusing on a firm's performance profile over time and its effect on leverage which is empirically puzzling. One example is Miglo (2007). Consider a firm that

invests in a project with cost c in each of two periods, $t = 1,2$. In each period the project may be either successful or unsuccessful. A firm's insiders have private information about the probability of success in each stage. The firms are of two types, type g and type b, with respective probabilities of success θ_{gt} and θ_{bt} in stage t.

Suppose g issues equity for each stage of investments and distributes period 1 earnings as dividends**.** In stage 2 the investors will require a fraction of equity $\propto_2$ such that: $\propto_2 \theta_{g2} = c$. In stage 1 investors will require a fraction of equity $\propto_1$ such that: $\propto_1 \theta_{g1} + \propto_1 (1-\propto_2)\theta_{g2} = c$. Now consider the payoff of shareholders of b in case b decides to mimick g. It equals$(1-\propto_1)\theta_{b1} + (1-\propto_1)(1-\propto_2)\theta_{b2}$. If a signaling equilibrium exists, the shareholders' payoff for type b is $\theta_{g1} + \theta_{g2} - 2c$ (the true value of b). Thus a separating equilibrium exists if $(1-\propto_1)\theta_{b1} + (1-\propto_1)(1-\propto_2)\theta_{b2} < \theta_{b1} + \theta_{b2} - 2c$. This can be simplified to:

$$\frac{\theta_{g1}+\theta_{g2}-2c}{\theta_{b1}+\theta_{b2}-2c} < \frac{\theta_{g1}+\theta_{g2}-c}{\theta_{b1}+\theta_{b2}(1-c/\theta_{g2})} \quad (6)$$

If the extent of asymmetric information regarding firms' total values is sufficiently small and also if $\theta_{g1} > \theta_{b1}$ and $\theta_{g2} < \theta_{b2}$, then (6) holds. In extreme case, for example, when $\theta_{g1} + \theta_{g2} - 2c = \theta_{b1} + \theta_{b2} - 2c$, (6) becomes $\theta_{g2} < \theta_{b2}$. The idea is that the value of shares in period 1 depends on the firm's total value and not on the firm performance in one particular period while the value of shares in period 2 depends on period 2 performance. Type with low overall value can benefit from overvaluation in period 1 but can have a loss from period 2 undervaluation. When asymmetric information regarding firms' overall values is relatively small while that about timing of earnings is high the latter effect can dominate.

A separating equilibrium where only high-value firms issue equity implies that firms issuing equity have better operating performance at the moment of issue or soon after the issue, and that these firms have lower operating performance in the long run. It also explains negative correlation between debt and profitability since more profitable firms in the first period issue equity.

Hennesy et al (2005) develop a dynamic model of the firm under repeated hidden information. In equilibrium firms signal positive information by substituting debt for equity. This explains the inverse relation between leverage and net worth. Firms with negative private information are unlevered. This is consistent with debt conservatism. The model generates a number of other predictions.

Security design, informed investors and information production

Sometime investors (for example banks) may produce information on firm's quality. Fulghieri and Lukin (2001) show that good firms will want to partition their securities so that some of the claims will be informationally sensitive. If the cost of becoming informed is low and the degree of asymmetric information is high, 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. This explains negative correlation between debt and the firm's value because low-profitable firms do not need to issue equity which is sensitive to firm's value. This also predicts that firms with larger growth opportunities and younger firms are more likely to be equity financed that is related to our discussion in POT.

Inderst and Mueller (2006) analyze a model where investors are better informed than insiders. Safe projects that are likely to break even based on easily verifiable (hard) information are financed with debt. Risky projects that are less likely to break even based on hard information are financed with equity. This explains why high-growth firms are financed with equity.

MARKET TIMING

The basic model, major results and evidence

The idea is that the decisions to issue equity depend on market performance (Lucas and McDonald (1990) and Korajczyk, Lucas, and McDonald (1992)). Consider a firm that is raising

equity for an investment project. The investment cost is c. The cash flow from the project equals t. There are two types of firm. Type g has assets in place which generate a cash flow I in addition to the cash flow from the project. Type b does not have any assets in place. t is a publicly available parameter that depends on macroeconomic situation. The firm's type is its private information. The initial capital structure is 100% equity.

Three situations are possible.

1. $t < c$.. In this case neither firm issues equity and undertakes the project. Both types of firm have negative net-present-value (NPV) projects.

2. $c < t < \frac{c+\sqrt{c^2+4I}}{2}$. In this case b issues equity and invests in the project and g does not. Indeed investors will require fraction $\propto$ of b's equity such that $\propto t = c$. If g mimicks b and issues equity, then the shareholders' payoff is $(1-\propto)(I+t)$. To sustain an equilibrium, this should be less than I. One can check that it holds if $t < \frac{c+\sqrt{c^2+4I}}{2}$.

3. $t > \frac{c+\sqrt{c^2+4I}}{2}$. Both types issue equity and undertake the project. g is undervalued and b is overvalued.

Equity issues and business cycle

The model predicts that when the economy is bad (t is low), firms do not issue equity. When economy is in the middle stage, equity will be issued by some firms and when economy is booming, equity issues are large. Empirical work by Choe, Masulis, and Nanda (1993), Bayless and Chaplinsky (1996), and Baker and Wurgler (2000) suggests a positive relation between equity issues and the business cycle.

Market timing

When $b < t < \frac{c+\sqrt{c^2+4I}}{2}$, g has positive NPV project but it is undervalued if it decides to issue. If $t > \frac{c+\sqrt{c^2+4I}}{2}$, g is undervalued as well but the undervaluation is less severe. In the latter case b is overvalued. An interpretation is that overvalued firms always issue equity. Undervalued firms

may wait until the cost of misvaluation will be low enough to be outweighed by the benefits from new projects.

Empirical evidence supports the prediction that share price performance is important for equity issues decisions (see Rajan and Zingales (1995), Baker and Wurgler (2002), and entrepreneurs' surveys by Kamath's (1997) and Graham and Harvey (2001)). Mixed evidence exists regarding *whether investors overpay for shares or not*. Some researchers argue that investors tend to be overoptimistic during new issues that the analysts' forecasts are inadequately high and that managers manipulate earnings prior to going public (Baker and Wurgler (2002), Teoh, Welch, and Wong (1998)). Some research argues in favor of efficient market version of the market timing argument (Hansen and Sarin (1998), Knill and Lee (2006)). Some research suggests that market timing is not based on good market performance as compared to firm's predicted performance. Instead it is based on the market performance prior to the issue ("pseudo-market timing", Schultz (2003) and Butler, Grullon and Weston (2005)).

Stock returns and equity issues

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. The evidence confirms this prediction (Korajczyk, Lucas, and McDonald (1990), Loughran and Ritter (1995)).

Extent of asymmetric information and equity issues

In the model the extent of asymmetric information can be measured by parameter I. Large I means that a large difference exists between types and vice versa. The model suggests that high I makes equity issues less frequent and vice versa. There are several interpretations of this result. After information releases, asymmetric information should be reduced. This is a good time to conduct equity issues. As time passes, managers receive new 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. Korajczyk et al (1991) 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 and that larger firms, which suffer less from asymmetric information, issue equity later.

Chang et al. (2006) argue that information asymmetry affects a firm's incentives to time the market. They show that firms with low information asymmetries (the ones with greater analyst coverage) have lower incentives to time the market. Firms followed by fewer analysts make infrequent but larger issues of equity.

Evidence mostly supports the market timing theory in that *managers wait until the market conditions get better*, that *stocks have high return prior to equity issues* and that *prior to issue firms window-dress or improve their performance*. Mixed evidence exists regarding whether *investors overpay for shares*. Also can we use the market timing theory to explain numerous phenomena about capital structure which we discussed in previous sections? The fact is that we lack theoretical models on market timing. As a result the authors have sometimes different opinion about the interpretation of market timing.

SUMMARY AND CONCLUSIONS

This paper surveyed 4 major theories of capital structure: trade-off, pecking order, signaling and market timing. Empirical evidence usually confirms the main prediction of trade-off theory that the *leverage should be inversely related to the expected bankruptcy costs*. The pecking order theory provides explanations for such phenomena as *negative correlation between debt and profitability*, *negative share price reaction on equity issue announcements* and *better share price reaction on debt issues than on equity issues*. Signaling theory is useful in explaining *negative market reaction on a broad range of leverage-decreasing transactions and positive*

reaction for some leverage-increasing transactions (excluding debt issues). Evidence mostly support market timing theory in that *managers wait until the market conditions get better* and that *stock have high return prior to equity issues* and that *prior to issue firms window-dress or improve their performance* at least on paper.

Also some considerable results have been attained recently to mitigate such long time problems for trade-off theory as debt conservatism and low sensitivity of debt with regard to tax changes. Considerable results have also been obtained about how to explain equity issues in the framework of pecking-order theory and signaling theories.

The overall situation is interesting: the trade-off theory can explain a lot of facts about capital structure, and it does not have many weaknesses except one which is very important: negative correlation between debt and profitability. The only theory which provides the straight explanation for this phenomenon is the pecking-order theory which on the other hand has mixed evidence regarding the pecking order itself.

Our feeling is that in the future dynamic models which incorporate both asymmetric information and trade-off ideas including agency costs need to be developed which will provide not only simulated result but also theoretical results in order to be comparable with basic theories. New theoretical models are required for market timing theory as well.

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