Agency Costs, Investment and Debt Overhang

D C WEBB

London School of Economics

June 22, 2022

Abstract

The paper develops a dynamic model of firm investment with agency problems. The approach taken follows that of Cao et.al. (2019) but integrates some features of Clementi and Hopenhayn (2006) and Bias et.al. (2011). A firm is faced with multi-period projects and needs to raise outside finance but cannot commit to honest reporting of income, so incentives must ensure honest reporting. This agency induced wedge between the cost of internal and external funds impacts investment policy. High cash flow reports increase the entrepreneur's equity stake and this tends to relieve the agency problem, thereby leading to more investment and earlier exercise of investment opportunities.. Faced with sequential investments, the wedge between the cost of internal and external finance can affect the way the firm ranks projects. In particular, projects that generate net cash flow quickly but are of relatively lower net present value may be prioritised so as to keep leverage and financial servicing costs low before higher net present value projects that deliver net cash flows more slowly are initiated. Even though the firm's capital structure is designed to mitigate this problem, leverage in particular has real effects upon investment policy. We also show how the moral-hazard problem interacts with a Myers (1977) debt-overhang problem and generates an interaction between leverage and the timing of exercise of growth options.

JEL Classification: D86;G30;G31;G32.

1 Introduction

This paper is concerned with the impact of a …rm's …nancial policies on its level of investment when there is moral hazard arising from outside …nance. This means that the volume of internal funds is important for investment, so that depending upon the …rm's current funding, investment may be lower than optimal so that internally generated funds can be used to …nance subsequent investment. Firms that have growth opportunities must manage leverage and debt service costs to limit agency costs and thus time growth.

A number of papers have developed simple discrete time, …nite horizon models of corporate …nance of given investments in the presence of moral hazard and have highlighted interesting properties of optimal …nancial policy. Key contributions are Bolton and Scharfstein (1990), Innes (1990) and Holmstrom and Tirole (1997). A number of more recent papers have added to our understanding of more general inter-temporal investment problems with repeated moral hazard. Gromb (1999) extends Bolton and Sharfstein's analysis to an in…nite horizon. Other papers apply recursive techniques developed to handle multi-period moral hazard problems (see Green (1987), Spear and Srivasta (1987) and Thomas and Worral (1990)) to consider dynamic investment -…nancing decisions. Quadrini (2003), analyses the investment problem in a stationary environment with a simple moral hazard problem, where non-convexities arise because of lumpy liquidation. Clementi and Hopenhayn (2006)

8he in res9neef

r s317(g)9(r)8(17(g)11(l)-338(()8(1820(0)11(6)01(7)10())-2931d)12(e)9(v)38(e)9((l)6(5)11(p)-16314)9(o) given investments but repeated moral hazard in …nancing. These papers essentially generalise the analysis in DeMarzo and Fishman (2007a) to continuous time and provide a variety of elegant results characterizing the solution to the agency problem and its implementation through …nancial contracts. Biais et al (2007) actually derive the continuous time problem as the limit of an in…nite-horizon discrete time problem and in doing so illustrate the optimal …nancial policy in both discrete and continuous time. However, these papers do not examine the interaction of the …rm's …nancial policy with its real investment decisions.[1] Later papers, for example Bolton et. al (2011) and DeMarzo et. al. (2012) consider the interaction of multi-period agency, security design, capital structure and real investment policy. Similar issues are considered in Biais et. al. (2011), who pay particular attention to the design of incentives to induce desired investment performance. Cao et. al. (2019) develop a discrete time model of …nancial frictions and the "q" theory of investment.

The present paper considers a model in which a …rm is faced with multi-period projects o¤ering di¤erent cash ‡ow pro…les. The approach taken follows that of Cao et. al. but integrates some features of Bias et. al. (2011). We investigate how the investment policy is a¤ected by the agency problem arising with external …nance. In particular, the …rm needs to raise outside …nance but cannot commit to honest reporting of income. We note and refer to Biais et. al. (2011) that the mis-reporting model is isomorphic to other moral hazard models with private bene…ts (Tirole 2006) or indeed costly e¤ort (de Meza Webb (2000) and numerous others). Hence, incentives must be put in place to ensure honest reporting.[2] This agency induced wedge between the cost of internal and external …nance impacts investment policy. The main result of the present paper is to show how a broad set of agency problems interact with investment policy. The behaviour of the …rm is sensitive to the timing of cash ‡ows, the variance of the company's earnings and the market interest rate. In this framework,

[1] DeMarzo and Sannikov (2006) and Biais et al (2007) provide a rigorous derivation of the link between the derivation of the corporate capital structure and the valuation of corporate liabilities.

[2] Alberquerque and Hopenhayn (2004) study lending and …rm investment dynamics with limited contract enforcement in a symmetric information environment. As Hopenhayn and Clementi (2006) note this model has quite di¤erent implication for …nancing and investment than the moral hazard model.

The principal empirical observations that this paper and related literature address, concern the link between variations in firm level investment and financial factors. In particular, the observed relationship between investment and current and anticipated agency problems and thus the importance of internal net worth (or equity). Hubbard (1998) provides a survey of the principal findings in the empirical literature relating to the link between investment and measures of internal versus external finance. The link of this investment behaviour to cash flow is found by Devereux and Schianterelli (1990) and Himmelberg and Gilchrist entrepreneur must raise …nance from a …nancier. Both the entrepreneur and the …nancier are risk neutral. The entrepreneur wishes to maximize

$$W_t \quad E_t{}_{s=t}^{s=\infty} \quad {}^{s}C_s,$$

where $<$ $=$ $<$ is a discount factor. The …nancier wishes to maximize,

$$F_t \quad E_t{}_{s=t}^{s=\infty} \widehat{}^{\,s} Y_s,$$

$\widehat{}$ $=$ $\widehat{}$. Here C_s is the cash payment from the …rm to the entrepreneur and Y_s is the payment nt +

subject to the financier's participation constraint:

$$E_t \widehat{\ } F_{t+1} \ !_{t+1} \quad R \ K_t; !_t \quad C_t \quad Y_t \quad F_t \quad I_t \quad J \ I_t \tag{2}$$

and the incentive compatibility condition

$$R \ K_t; !_t \quad R \ K_t; \hat{!}_t \quad W \ K_{t+1}; F_{t+1}; !_{t+1} \quad W \ \widehat{K}_{t+1}; \ \widehat{\ }$$

Let $\widehat{\quad}$, using $\boldsymbol{V_t}$ $\boldsymbol{F_t}$ $\boldsymbol{W_t}$

Moreover, we have the implied pricing condition

$$t \quad E_t \quad t+1 \frac{R_K \; K_{t+1}; !_{t+1} \qquad J' \; I_{t+1} \quad Y_{t+1} \quad F_{t+1}}{J' \; I_t \quad \hat{} E_t F \; !_{t+1}} \tag{16}$$

Now we can determine average q, denoted by q^a,

$$q^a \quad \frac{E_t W \; K_{t+1}; F_{t+1}; !_{t+1} \quad E_t \hat{} F \; !_{t+1}}{K_{t+1}}$$

From (13)

$$t \quad \frac{E_t W_K \; K_{t+1}; F_{t+1}; !_{t+1}}{J' \; I_s \quad \hat{} E_t \frac{dF(!_{t+1})}{dK_{t+1}}}$$

and noting that $q_t^m \quad J' \; I_t$, so

$$t \, q_t^m \quad \hat{} E_t \frac{dF \; !_{t+1}}{dK_{t+1}} \quad E_t W_K \; K_{t+1}; F_{t+1}; !_{t+1}$$

Now if $W{=}K \quad W_K$ and $F{=}K \quad dF{=}dK$, we can write

$$t \, q_t^m \quad q_t^a \quad E_t W_K \; K_{t+1}; F_{t+1}; !_{t+1} \qquad E_t W_K \; K_{t+1}; F_{t+1}; !_{t+1}$$

so

$$q_t^m \quad q_t^a \quad \frac{t}{t} \; E_t W_K \; K_{t+1}; F_{t+1}; !_{t+1} \tag{17}$$

which is positive if $_t >$ when $_{t+1} >$.

that can be pledged out of income being $R(K_t; \omega_t)$. If outside ﬁnance takes the form of a sequence of one-period pure discount claims, Y_t and F

The above yields a simple monotonically decreasing link between investment and the extent of the agency problem. High cash flow reports increase the entrepreneur's equity stake and this tends to relieve the agency problem, thereby leading to more funds being advanced by the financier. Thus there is positive serial correlation between cash flow and investment and of investment with investment over time.

In, for example, the models of Clementi and Hopenhayn (2006) and DeMarzo and Fishman (2007a), the agency problem and the importance of current cash flow is greatest for firms with capital held significantly below the level that would obtain in the absence of the constraint. These firms are small relative to their optimal size. Increased cash-flow risk increases the cost to the financier of providing incentives. In particular, the more variable cash-flow, the more expensive it is to provide incentives. Intuitively, we might expect this to depress the firm's current capital stock and investment rate and create caution in expanding it.

Finally, in this framework, if the entrepreneur has low initial funds and is reliant on external finance he will have a preference for projects that generate more cash quickly. Hence, if faced with a choice of two mutually exclusive investment plans, with one generating cash earlier than the other, even if the latter is intrinsically higher net present value, as we will demonstrate later, the entrepreneur may prefer the former.

3 Implementation by the Optimal Financial Policy.

In the above, we see that the entrepreneur must have an equity stake. In particular we need to make sure that the entrepreneur always has a sufficient stake in the company going forward. The financier allows the entrepreneur access to contingent lump-sum transfers. Given the scale of the firm, the entrepreneur always has a high enough equity stake to prefer efficient continuation, to diverting income. If the incentive constraint is binding, the share in future income matches the gain from lying. To insure that incentives are maintained in the light of shocks, the financier provides a credit facility to the firm, which can be drawn upon as a function of reported income. As noted by Hart and Moore in a number of papers (see for example Hart and Moore (1994)) and as rigorously demonstrated by DeMarzo and Sannikov (2006) and Biais et al (2007), the role of long-term debt is to adjust the profit rate so that the entrepreneur's return is consistent with truthful reporting. This is a feature of the present model. There exists an optimal level of debt, such that if debt is too high the entrepreneur will simply run down the credit balance. On the other hand, if it is too low the entrepreneur will build up cash to reduce risk.

The financier manages his exposure to the project. Starting with an initial advance of $K_0 \quad A_0$, the financier receives an income of Y_t from which the cost of capital inclusive of agency costs is deducted and a further advance to the entrepreneur of $I_t \quad J_t$ is made and so on period by period. In general, at each date the financier must have a claim, $F \; W_t; !_t$, worth at least as much as the opportunity cost of capital advanced to the project. On the other hand, in the event that no capital is advanced to the project, the project is liquidated for $L \; K_t$ and this is recovered by the financier. In the event of the firm continuing: For $W_t < W_t^{**}$, $F \; W_t; !_t \quad F \; W_t^{**}; !_t$ and in this region after income is realised, the firm is liquidated with probability x_t and all income is paid to the financier. For $W_t^{**} \quad W_t \quad W_t^{*}$, x_t and $F \; W_t^{**}; !_t \quad F \; W_t; !_t \quad F \; W_t^{*}; !_t$, and again all income is paid to the financier. Finally, for $W_t \quad W_t^{*}$, the agency constraint is no longer binding, so that capital can be supplied at the first-best level and the value of the financiers position is held at the reflecting barrier $F \; W_t^{*}$.

There is a maximum level of sustainable outside finance $\overline{F}$, which corresponds to the lowest level of W in the the region where $F' \; W \; <$. There are two possible cases: the corresponding value of equity is either zero or positive. In the first case the contract is renegotiation proof, and $\overline{F} \quad L \; K_t$, the liquidation value. The entrepreneur's outside finance is fully collateralized. In the second case, $\overline{F} > L \; K_t$ and the claims of financiers can exceed the value of collateral. In this case, the extent of outside funding is governed by the incentive constraint and hence the credible amount of value that can be guaranteed to the financier, which is the present value of income not needed to maintain the entrepreneur's commitment to the firm without cheating.

The above solution to the dynamic investment-financing problem can be implemented in a simple way. The firm is financed with debt, short-period debt B_t that must be repaid each period so that new debt must be issued each period, and equity, S_t. The entrepreneur has to have a sufficient equity stake, S_t. The financier agrees to supply F_0 K_0 A_0 and also agrees to fund subsequent investment needs by extending debt finance as a function of reported income. The gross income stream paid to the financier must at least meet repayment of the capital advanced and interest. The financier's claim to cash flows is F_t V_t W_t. This investment is held as stocks and bonds with value S_t B_t. Then at date t , F_0 S_0 B_0 and subsequently F_t S_t B_t. The entrepreneur's equity position grows with good income realisations and contracts with poor ones. Only when the entrepreneur's equity stake is high enough and debt has been paid-off can the entrepreneur be trusted not to cheat. The crucial point is that the entrepreneur has to have a sufficiently large equity stake to maintain incentives but at the same time must also have to make contractual payments, debt service payments to the financier, thereby reducing leverage as quickly as possible so as to keep the constraining effect of agency costs on investment to a minimum.

At each date we impose the incentive condition that the entrepreneur prefers, or is indifferent between continuing and taking his share of the capital advanced to the project as a special dividend and then defaulting so long as W_t W^*. If $W_t < W^*$, then all income is used to pay bondholders until B_t , capital is supplied up to the limit implied by the incentive constraint. If $W_t > W^*$ and B_t , then the first-best level of investment is incentive compatible and dividends can be paid. This feature of the optimal contract is a feature of bilateral financial arrangements that only trigger dividends when certain performance targets have been reached, see Biais et al (2007), DeAngelo, De Angelo and Stultz

(2006) and Kaplan and Stromberg (2003 and 2004).

Because the value function W_t is concave in F_t; at low levels of W_t, the debt-equity ratio is high and the cost of providing incentives $dW_t/d\overline{F}\ \omega_{t+1}$ is high. Hence, the incentive to reduce debt and build up capital is high. In this region, investment is heavily cash-flow constrained and a premium is placed on building up the equity value of the firm.

4 Growth Options

In the problem we have examined, maximising the entrepreneur's wealth is consistent with maximising the value of the firm as the objective function. A concern emerges if the outside financier holds risky debt, which can be motivated by reference to the classic Myers (1977) problem. Myers starts from the perspective of a firm that has an existing set of operations financed with equity, S_t^o, and risky debt, B_t^o so $V_t^o \quad S_t^o \quad B_t^o$. Suppose that at any date, there is a probability that the project fails. In this event, the cash return from the project is zero and the liquidation value of the project, $L\ K_t$ is realised. In the event of default, the financier receives the residual value of the project and the entrepreneur nothing. The firm is then faced with an initially unforeseen growth opportunity, not priced into initial security returns with stand alone value V_t^g that costs I_t. Suppose that this option was to be financed with new debt, B_t^g, that is not a project specific claim and that the original debt, B_t^o, has a senior claim on all income including that from the option. The the new debt must be fairly priced but the exercise of the option reduces the default risk of the original debt, so that $B_t^o >$, and even though $V_t^g \quad I_t >$, it is possible that $S_t^o <$, so that it is not in initial shareholders' interests to exercise the option. Myers calls this a "debt overhang problem". Of course, this solution is not renegotiation proof. If the option is not exercised the initial debt holders will be worse-off and will be willing to cut the face value of their claim to ensure ing model we have developed. Of course, it will matter whether the growth opportunity is anticipated or unanticipated. Denote the capital invested in the initial project as $\boldsymbol{K_t^o}$. First, introduce the possibility that at some date , after the initial project has been commenced but before the optimal value, $\boldsymbol{K^{o}}^{*}$, is reached, the …rm has an initially unanticipated growth trepreneur, inclusive of the growth option of W_t^A with the financier's position given by $F_t^A \quad F_t^o \quad F_t^g$. The growth option will be exercised if it can be financed, so that $F_t^g \qquad$ and the equity value of $W_t^A \quad W_t^o$, is increased. If the growth option is entirely separable from the initial investment, the growth option is analogous to the initial investment and fully additive. In this case, the option should be exercised, if it is positive net present value, as son as it nmaterialises. This is not the case if the initial project is financed at least in part with risky debt and this debt is a senior claim on the firm's total income stream and assets, so that in an insolvency event it has first claim. Suppose, therefore, that the initial investment involved the issue of an initial amount of outside finance, $F_0^o \quad K_0 \quad A_0$ and subsequent finance from the financier until self-sufficiency is obtained. Moreover, suppose that $W_t^o < W_t^{o*}$ so there is a positive probability of default. Then, if the investment option is undertaken, some of the value generated will increase the value of the initial financial claim F_t^o, by $\quad F_t^o$. In raising the value of this claim, the agency costs constraining the initial investment are reduced, by allowing the entrepreneur to achieve self-finance of this project earlier, thereby raising W_t^o by $\quad W_t^o$. The entrepreneur will sanction the growth option investment with initial funding of F_0^g if $W_t^A \quad W_t^o$ and $W_t^A > \widehat{W_t^A}$, but the increase in W_t^A is constrained by the agency cost of debt overhang $\quad F_i^o$. The optimal exercise of the investment option will trade-off the agency cost of debt overhang against the benefits of alleviating the agency costs of moral hazard constraining the initial project.[4]

We begin with a firm that has initiated an investment programme with outside finance.

…rm's EBITDA is used to pay …nanciers and pay down outside liabilities. The …rm is then faced with a growth opportunity, which in order to be exercised, has to add to the value of the entrepreneur's equity stake and be part of a sustainable …nancial plan comprising of the initial investment's and the growth opportunity's income and expenditure streams.

As soon as the growth opportunity materialises, the problem can be written recursively starting with the growth opportunity and working back to the initial investment. In the absence of any agency problems, the outcome of the investment problem will be the unconstrained …rst best. If the growth option is known and is of positive net present value it will be implemented as the solution to the full-information benchmark case examined above, which applies under self-…nance or with external …nance but no agency problem, so that $_{t+1}$. Execution of this project involves the outlay of K^{g}, followed by subsequent investments of I^{g}_{t}. Given this solution, we step backwards to the initial decision in which the investment outlay of K^{o}_{0} is made, followed by K^{o}_{t} and K^{g}_{0} in turn followed by I^{o}_{t}, which must satisfy an additive problem as outlined below.

In the presence of agency problems, matters are more complex. The …rst point to address is the impact of any initial discrete start up investment cost for the growth option, K^{g}_{0}. To undertake the growth option, the entrepreneur must secure funding. If this was unanticipated when the initial investment was initiated and the cash ‡ows are not separate, then the value of the initial …nancial claim will be impacted, F^{o}_{t} > , and hence a reduction in the constraint on the funding of the initial investment so that W^{o}_{t} > . This only applies to the extent that F^{o}_{t} is risky and hence W^{o}_{t} is exposed to this risk. This is greatest when W^{o}_{t} is low relative to W^{o*}_{t}, so that the leverage of the initial project remains high. However, when the project is initiated, the jump increase in W^{A}_{t} net of F^{o}_{t} and inclusive of any increase in W^{o}_{t}, must be positive. In other words, the debt-overhang e¤ect is a transfer from the entrepreneur to the initial-…nancier. This transfer cannot be too large, so that the entrepreneur participates, W^{A}_{t} W^{o}_{t} and incentives are maintained, W^{A} K^{o}_{t+1} $K^{g}_{t+1}; F^{o}_{t+1}$ $F^{g}_{t+1}; !_{t+1}$ $\widehat{W^{A}_{t}}$ $!_{t+1}$. Thus, even though the growth opportunity is positive net present value, its exercise will depend upon the debt overhang e¤ect, which is lower at higher values of W

to initiate the growth option a discrete outlay of K^g is required. Moreover, even though the growth option has become known at some date after the initial investment is initiated, the firm is still faced with a choice of when to exercise it.

At the point of discontinuity, K^g is invested in the growth opportunity, so at this point total investment is $K^o \quad K^g$, and total external finance is $F^o \quad F^g$, with $F^g \quad K^g$. The optimisation programme needs to determine the conditions that must hold at the time of dicontinuity, . To the right of this point the value function is $W \; K^o \quad K^g; F^o \quad F^g; !$

$W \; K^o; F^o; !$

and using the envelope condition $W_F \; K_t^o \quad K_t^g; F_t^o \quad F_t^g; !_t \qquad\qquad !_{t+1}$

$$ {}_t \quad \frown_{t+1} \quad \frown_{t+1} \qquad (24)$$

Note again that if the incentive constraint is binding, ${}_{t+1} >$ and ${}_t >$.

The above problem is for a single entrepreneur or …rm …nanced by a single …nancier. The growth option involves an initial investment followed by a sequence of further investments, implemented subject to adjustment costs and agency costs. The option may or may not be in the …rm's plans at the date the original investment is initiated. Once the option is initiated, the optimisation problem is a consolidated problem, with a single …nancier participation condition and a single incentive constraint for each state. This means that if the value function for the entrepreneur is given by $W_t^A \quad W \; K_t^o \quad K_t^g; F_t^o \quad F_t^g; !_t$, then the two thresholds for the value function (eqivalent to W_t^{**} and W_t^{*}) are given by W_t^{A**} and W_t^{A*}

thes(i)6(v)65(a)10d5t

. To the right of this point, the value function is $W\ K^2\quad K^1;F^2\quad F^1;\ !\qquad W\ K^2;F^2;\ !$, (negative NPV) investments. In the former case there will be an incentive to renegotiate debt, to reduce the debt-overhang and allow the investment to be undertaken.

The key point of the above discussion is that the agency problems of free-cash-flow and equity dilution are in theory most acute for firms that have exhausted positive net-present-value investments. The agency model we have examined above in its basic form examines the evolution of the firm's investment and financing problem, with the agency problem declining if the firm has a series of positive cash flow outcomes that enables the entrepreneur to achieve self-finance and no longer be constrained from obtaining first-best investment because of agency problems. The crucial point here is that the financier limits the entrepreneur's access to funds but incentivises him to pay down the financiers position, whilst being committed to truthful reporting. Here the agency problem is at its greatest when reliance on external finance, leverage, is high. Moreover, we have argued that investment in growth options may be delayed until cumulative firm performance brings overall leverage down to a point that incentives on the combined projects can be maintained and any debt over-hang problem mitigated.

7 Risk Shifting

In the above, higher cash-flow risk increases the cost of maintaining incentives and so makes it more expensive for the firm to finance its investments. This can be seen in condition (3), where the magnitude of the term $W(K_{t+1}, F_{t+1}, \omega_{t+1}) - W(\widehat{K}_{t+1}, \widehat{F}_{t+1}, \widehat{\omega}_{t+1})$ reflects the variance of cash flows. When debt is risky, increases in cash-flow risk increase the variability of cash flow in the region below W_t^{***}, which increases the probability of termination and also reduces the value of equity. DeMarzo and Sannikov(2006) relate this to the asset substitution problem in corporate finance (see Jensen and Meckling (1976)) and argue that in this type of contracting environment the above mechanism precludes the problem. The asset substitution problem is an incentive problem that is eliminated if both the entrepreneur and financier hold only equity stakes in the company but in this model, the entrepreneur must have a big enough claim to ensure no cheating. However, we have also seen that the optimal …nancial policy must ensure that the …nancier is paid of through a series of contractual payments, namely debt service payments. But it is precisely this type of capital structure, in which the entrepreneur holds a leveraged convex claim that the asset substitution problem exists. That is, after debt is issued, there is an incentive to switch to higher risk investments but the entrepreneur would like to commit to a low risk strategy.

With debt …nancing, if the …rm has increased cash-‡ow risk, then agency costs are incurred and this will, as we have seen, lead to a lower level of capital accumulation so long as the now more severe incentive constraint binds. But consider the …rm at the early stage of its development, when after it obtains initial …nance the debt-equity ratio is high and the agency problem is signi…cant. At this stage, the entrepreneur-equity holder, who has a deeply out of the money convex claim, may be tempted to incur the burden of increased agency costs for a gain at the expense of the outside …nancier, who holds a lot of debt. Of course, given sequential rationality, in the sub-game perfect equilibrium of the …nancing game, the …nancier would anticipate any shift in the cash-‡ow risk, and price the debt accordingly. To mitigate this problem, the …nancier needs a contingent claim that in the event of an increase in risk allows him to increase his equity stake. The terms of this contract would have to be modi…ed to satisfy a risk shifting incentive constraint along the equilibrium path. This convertible contract, in this case a convertible bond, was proposed as the incentive-compatible contract in the original Jensen-Meckling framework by Green (1984). A complex variant of this contract could play a role at some stage in the ea(r)11(r)11(e)(4n)11(c)10(r)12tp9l(l)5ga, tht …nanci9l

8 Conclusion

This paper has studied investment under uncertainty when there are adjustment costs in changing the capital stock and agency problems in …nancing investment. The agency problem arises from only the entrepreneur observing returns and needing to be incentivised by …nanciers to act truthfully. The paper demonstrates the interaction of the adjustment costs of changing durable investment and the agency problem arising from external …nancing. The former means that the timing of investment depends upon these costs. The latter means an initial preference for cah ‡ow over net-present -value.

References

[1] Abel, A.B. and J.C. Eberly, (1996), "Optimal Investment with Costly Reversibility," Review of Economic Studies, 63, 581— 593. 48

[2] Abel, A.B., A.K. Dixit, J.C. Eberly, and R.S. Pindyck, (1996), "Options, the Value of Capital and Investment," Quarterly Journal of Economics, 111, 753-777.

[3] Alberquerque, R., and H. Hopenhayn, (2004), "Optimal Lending Contracts and Firm Dynamics," Review of Economic Studies, 71, 285— 315.

[4] Almeida, H., M. Campello, and M. Weisbach, (2004), "The Cash Flow Sensitivity of Cash," Journal of Finance, 59, 1777-1807.

[5] Almeida, H., and M. Campello, (2005), "Firm Financing-Investment Interactions: Evidence from Debt and Equity Issues," Working Paper, New York Universsity.

[6] Biais, B,R. T.Mariotti, G. Plantin, and J.C. Rochet, (2007),"Dynamic Security Design: Convergence to Continuous Time and Asset Pricing Implications", Review of Economic Studies, 74, 345-390.

[7] Biais, B,R. T.Mariotti, and J.C. Rochet, (2011), "Dynamic Financial Contracting", Mimeo.

[8] Bolton, P., and D. Scharfstein, (1990), "A Theory of Predation Based on Agency Problems in Financial Contracting," American Economic Review, 80, 93— 106.

[9] Bolton, P., H. Chen, and N. Wang. (2011), "A Uni…ed Theory of Tobin's q, Corporate Investment, Financing,

and Risk Management,". Journal of Finance 66, 1545–78.

[21] Fazzari, S. R., R. G. Hubbard, and B. Petersen, (1988), "Financing Constraints and Corporate Investment," Brookings Papers on Economic Activity, 1, 141–195.

[42] Stulz, R.M., (1990), "Managerial Discretion and Optimal Financing Policies", Journal of Financial Economics, 26, 3-27

[43] ———- , and H. Johnson, (1985), "An Analysis of Secured Debt", Journal of Financial Economics, 14, 501-521.

[44] Thomas, J., and T. Worral,(1990), "Income Fluctuations and Asymmetric Informa-