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"Modeling the effects of financial constraints on firm's investment"

The paper builds on a well-established literature (Abel, 1983; Abel and Eberly, 1994; and Bertola and Caballero, 1994) on firms' investment decisions with capital adjustment costs. In addition to firms' investment decisions, the paper also models firms' debt financing decisions. To get around the Modigliani-Miller capital structure irrelevance result, a number of frictions are introduced. First, the discount rate of the firm ρ is assumed to be greater than the riskfree borrowing rate r. By itself, this friction would lead to an infinite debt. To limit the debt, a second friction is introduced: an exogenous upper limit on borrowing $\bar{N}$. While these two frictions by themselves would define an optimal debt level, the solution would be uninteresting. The firm would always borrow at the upper limit and there would be no interaction with the "real" investment choice. Therefore, a third friction is introduced: the financial constraint.

In the recent theoretical literature on financial constraint (see the work of Joao Gomes, Christopher Hennessy, Nathalie Moyen, Toni Whited, Lu Hang, among others), financial constraints are represented in different ways. Financial constraints are sometimes represented by a greater cost to raising external funds than relying on internally-generated funds. Other times, financial constraints are represented by an infinite cost to equity funds, that is, a hard constraint restricting dividends to be positive so that the firm cannot ask equityholders for more funds. This paper uses the second representation.

Firms will be able to invest at their desired level when they generate enough internal cash flows or when they can raise sufficient debt financing

(within the upper limit allowable $\bar{N}$). The paper shows that firms sometimes want to invest more than their internal and debt funds available. In that sense, firms are constrained by their no-equity financing constraint.

The paper is well executed and generally well written. Below, I make four suggestions.

1. It is not clear what the contribution of the paper is. As mentioned above, there are already a number of papers examining the interaction between investment and financial decisions of firms facing financial constraints. Not only should the paper cite this work, but the paper should also clearly state its contribution over and above the previous work in that area. As it is currently written, the reader is left wondering what's new here.

   The conclusion points to two areas where the paper could contribute. The first area is using the model to address the empirical results of Fazzari, Hubbard, and Petersen (1988) and Kaplan and Zingales (1997). However, this contribution has already been made by Gomes (2001), Hennessy and Whited (2005), Moyen (2004), among others. The second area is using the model's Euler equation and estimating it empirically. Again, this contribution has been made by Whited (1992), among others.

2. Firms facing the constraint that they cannot ask equityholders for more funding would likely be very careful when managing their internal cash flows. It seems reasonable to allow firms to keep funds internally from period to period instead of requiring them to pay out all cash flows as dividends each period. This is a reasonable assumption and, in fact, the data show that firms do maintain large cash holdings from year to

year. I understand that allowing for cash stocks may complicate the model to the extent that closed-form solutions are no longer possible. At a minimum, this issue should be discussed.

3. It would be more appealing to give economic meaning to the assumption that $\rho > r$. For example, it is common in the capital structure literature to assume that the rate at which individuals are taxed on their interest income is lower than the rate at which firms can deduct their interest payment. Explicitly accounting for taxes would result in the same after-tax ranking for ρ and r.

4. Finally, equations (3.3) and (3.4) merit more motivation in the text rather than just stating that they are the slackness conditions. For clarity, move some of the material in the appendix to the main text.