

# INVESTMENT-CASH FLOW SENSITIVITIES ARE NOT VALID MEASURES OF FINANCING CONSTRAINTS\*

STEVEN N. KAPLAN AND LUIGI ZINGALES

Work by Kaplan and Zingales provides both theoretical arguments and empirical evidence that investment-cash flow sensitivities are not good indicators of financing constraints. Fazzari, Hubbard, and Petersen (this *Journal*) criticize those findings. In this note we explain how the Fazzari et al. criticisms are either very supportive of the claims in earlier work by Kaplan and Zingales or incorrect. We conclude with a discussion of unanswered questions.

Fazzari, Hubbard, and Petersen (1988) (hereinafter, FHP (1988)) introduce a methodology to identify the presence of financing constraints based on the differential sensitivity of corporate investment to cash flow. Kaplan and Zingales (1997) (hereinafter, KZ) provide both theoretical arguments and empirical evidence that this differential sensitivity is not a valid measure of financing constraints. Fazzari, Hubbard, and Petersen (2000) (hereinafter, FHP (2000)) criticize those findings. In this note we explain that the main arguments in FHP (2000) are, in fact, quite supportive of KZ's main conclusion, while the specific criticisms in FHP (2000) are unjustified.

## I. POINTS OF AGREEMENT

FHP (2000) admit that financially distressed firms are likely to have lower investment-cash flow sensitivities than less financially constrained firms. This is exactly the point that the KZ model makes: investment-cash flow sensitivities are not necessarily monotonic in the degree of financing constraints. The only disagreement FHP (2000) have with KZ is how pervasive the nonmonotonicity result is. But this is ultimately an empirical question.

FHP (2000) also recognize that the literature on investment-cash flow sensitivities has not been based on a solid theoretical foundation. As KZ point out, the practice of (1) splitting the sample according to a measure of financing constraints and then

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(2) comparing investment-cash flow sensitivities across groups is justified only if investment-cash flow sensitivities increase monotonically in the degree of financing constraints. Neither FHP {1988}, nor any other paper of which we are aware, spells out the sufficient conditions for monotonicity.

## II. POINTS OF DISAGREEMENT

We disagree with FHP {2000} on three specific points: (1) their comparative statics analysis; (2) their criticism of the KZ classification scheme; and (3) their criticisms of the KZ empirical results.

### A. Comparative Statics

As we see it, there are two ways for a firm to be more constrained than another one.

First, a firm may have fewer internal funds than another. This corresponds to the parameter  $W$  in KZ's model. The appropriate comparative static is then obtained by computing  $d^2I/dW^2$ , as we did in KZ. Our result is reproduced as equation (2) in FHP {2000}.<sup>1</sup> In this case, the appropriate condition for monotonicity is the one we report rather than the one proposed by FHP {2000}.

Alternatively, one firm may be more constrained than another because the firm's intrinsic characteristics make it more costly to raise a *given* amount of external funds. The appropriate comparative statics exercise requires the explicit parameterization of intrinsic firm differences. This is precisely what we did in KZ, where we introduced a parameter  $k$  in the cost function of external finance,  $C(I - W, k)$ . In the KZ model,  $k$  represents the extent to which a firm's inherent characteristics make it more or less constrained.<sup>2</sup> In KZ we discussed, but did not report, how the investment-cash flow sensitivity varied with the extent to which a firm was constrained because of its intrinsic characteristics,  $d^2I/dkdW$ . The appropriate condition for monotonicity is that  $\partial^2I/\partial W\partial k > 0$ . This derivative can be written as

$$(1) \quad \left( -F_{11}C_{112} - F_{11}C_{111} \left( \frac{dI}{dk} \right) + F_{111}C_{11} \left( \frac{dI}{dk} \right) \right) / (C_{11} - F_{11})^2.$$

1. This formulation is relevant for papers in the literature that split firms on the basis of the availability of internal funds, such as FHP {1988}, who split on the basis of the amounts of dividends paid.

2. This formulation is relevant for papers in the literature that split firms by corporate grouping such as Hoshi, Kashyap, and Scharfstein {1991}.

FHP claim that  $C_{112} > 0$  (firms with higher  $k$  have a higher slope of the external finance schedule) is a sufficient condition for monotonicity, if  $F_{11}$  is homogeneous across firms. The equation above makes it clear that this is only the case if we do not take into account the impact of the firm's intrinsic characteristics ( $k$ ) on total investment ( $I$ ). Notice that  $-F_{11}C_{112} > 0$  if  $C_{112} > 0$ , but the rest of the numerator can be either positive or negative, depending on the signs of  $dI/dk$ ,  $F_{111}$ , and  $C_{111}$ . If these derivatives were equal to zero, FHP would be correct, but this is hardly a reasonable case. In other words, the FHP condition  $C_{112} > 0$  does not guarantee monotonicity.

Substituting for  $dI/dk$  in (1), the correct condition for monotonicity is

$$(2) \quad \frac{d^2I}{dkdW} = \frac{C_{112}F_{11}^2 - C_{112}C_{11}F_{11} + C_{12}C_{111}F_{11} - C_{12}C_{11}F_{111}}{(C_{11} - F_{11})^3} > 0.$$

It is difficult to argue that (2) is always satisfied—as FHP (2000) and the existing literature on financing constraints would require. In fact, it is easy to construct examples in which this derivative is positive and in which it is negative. For example, if the cost function and the production function are quadratic and the cost of external finance is of the form  $C = kE^2$ ,  $E = I - W$ , then  $d^2I/dkdW$  will be positive. Alternatively, if the production function is of the form,  $F = I^a$  where  $0 < a < 1$ , and the cost of external finance is of the form  $C = kE + E^2$ , then  $d^2I/dkdW$  will be negative.

Finally, the FHP (2000) arguments assume that the cost of raising external funds  $C(E, k)$  is convex in  $E$ , while KZ hypothesize and Stafford (1999) presents evidence that  $C_{11}$  is negative. This further weakens the case for monotonicity.

### B. Classification Scheme

FHP (2000) also question the validity of the KZ classification scheme, which relies, at least in part, on a company's cash balances or unused lines of credit. FHP claim that large amounts of these accounts indicate that a firm is taking the precaution of saving for fear of becoming constrained in the future. Thus, according to FHP (2000), firms with *more* cash holdings are *more* financially constrained. In fact, our methodology of considering management's statements of liquidity was designed precisely to reduce the ambiguity of "objective" criteria. Such a detailed analysis can distinguish between precautionary savings and pure financial slack.

For example, in 1997, Microsoft had net income of \$3.5 billion,

capital expenditures of \$0.5 billion, no investment in inventories, no dividends, and no debt, yet held almost \$9 billion of cash—or eighteen times capital expenditures. By the logic of both FHP {1988} (no dividends) and FHP {2000} (high cash balances), Microsoft would be classified as financially constrained. This classification would be lent support by Microsoft's investment-cash flow sensitivity of 0.53 from 1986 to 1997—higher than the sensitivity of the most constrained group in FHP {1988}. In contrast, by our criteria, Microsoft would qualify as not financially constrained. We believe that our classification is the more plausible one.

At the same time, the endogeneity of a firm's financial position strengthens the theoretical reasons why investment-cash flow sensitivities are not monotonically increasing in the degree of financial constraints, as recently shown by Almeida {1999}. He analyzes the response of investment to profitability shocks when leverage is endogenously determined. Firms with more liquid assets borrow more and, thus, are more sensitive to profitability shocks because of the well-known leverage effect. Less financially constrained firms, then, exhibit higher investment-cash flow sensitivities than similar firms, which have less liquid assets, and thus are more financially constrained.

### *C. Empirical Results*

Finally, FHP {2000} criticize the empirical findings in KZ on two primary dimensions.

First, they claim the KZ results are due to the lack of heterogeneity in the sample. While it is possible that the KZ sample is homogeneous, Cleary {1999} obtains similar results for a large (over 1300) and undeniably heterogeneous sample of firms.

Second, they claim the financially constrained firms in KZ are financially distressed and the nonfinancially constrained firms are, in fact, financially constrained. As we stressed earlier, we believe that financial distress is a form of being financially constrained so that the distinction FHP {2000} make is not relevant to our arguments. Nevertheless, it is difficult to claim that the firms KZ classify as possibly financially constrained (PFC), which exhibit the lowest sensitivity of all, are in fact distressed. For example, the median interest coverage ratio in PFC firm-years is 4.2—which is roughly the average coverage

ratio for firms rated BBB (investment grade) by Standard & Poor's.<sup>3</sup>

### III. QUESTIONS FOR FUTURE RESEARCH

The empirical analysis in KZ shows that less constrained firms exhibit a higher sensitivity of investments to cash flow. KZ also shows that this is perfectly compatible with value-maximizing behavior by firms facing different degrees of financing constraints. But, in practice, is the nonmonotonicity we observe driven by the value-maximizing behavior assumed in the model?

Most of the papers in this literature assume value-maximizing behavior by firms, and then attribute all observed deviations to financing constraints. In fact, it is hard to explain the high investment-cash flow sensitivities of firms like Hewlett-Packard (see KZ) and Microsoft as the result of financing constraints. It is also difficult to explain them as the result of traditional agency problems, because both Hewlett-Packard and Microsoft have high levels of managerial ownership.

FHP's {2000} defense of investment-cash flow sensitivities as measures of financial constraints distracts attention from the more important question: what causes this sensitivity? We do not pretend to have given an answer to this. We conjecture that the sensitivities are at least partially caused by excessive conservatism by managers, which may arise because of the way firms are organized internally or because of nonoptimizing behavior by managers as suggested by Hines and Thaler {1995}.

GRADUATE SCHOOL OF BUSINESS,  
UNIVERSITY OF CHICAGO

### REFERENCES

- Almeida, Heitor, "Financial Constraints, Asset Liquidity and Investment," working paper, University of Chicago, April 1999.  
Cleary, Sean, "The Relationship between Firm Investment and Financial Status," *Journal of Finance*, LIV (1999), 673-692.  
Fazzari, Steven, R., Glenn Hubbard, and Bruce Petersen, "Financing Constraints and Corporate Investment," *Brookings Papers on Economic Activity* (1988), 141-195.

3. FHP {2000} criticize Cleary {1999} on the same grounds. Yet Cleary {1999} also finds a relatively low sensitivity for partially constrained (clearly not distressed) firms.

- Fazzari, Steven, R. Glenn Hubbard, and Bruce Petersen, "Investment-Cash Flow Sensitivities Are Useful: A Comment on Kaplan and Zingales," *Quarterly Journal of Economics*, CXV (2000), 695–705.
- Hines, James, and Richard Thaler, "The Flypaper Effect," *Journal of Economic Perspectives*, IX (1959), 217–226.
- Hoshi, Takeo, Anil Kashyap, and David Scharfstein, "Corporate Structure Liquidity and Investment: Evidence from Japanese Panel Data," *Quarterly Journal of Economics*, CVI (1991), 33–60.
- Kaplan, Steven, and Luigi Zingales, "Do Financing Constraints Explain Why Investment Is Correlated with Cash Flow?" *Quarterly Journal of Economics*, CXII (1997), 169–215.
- Stafford, Erik, "Managing Financial Policy. Evidence from the Financing of Extraordinary Investments," Working paper, University of Chicago, 1999.