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# Adjustment costs, financial frictions and aggregate investment



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## ABSTRACT

We develop a simple theoretical model of investment under the assumption that financial frictions generate adjustment costs different from those of industrial origin that are normally discussed in the literature. We identify several restrictions that are used to test and estimate the model using aggregate data for the United States. We find strong evidence that adjustment costs on external finance are significant. We then investigate whether the availability of external finance affects investment of non-financial corporations. We find that a strong relationship holds between financial flows and investment. Shocks to investment have a persistent impact on external finance, whereas the impact on investment of external finance shocks is less persistent.

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## 1. Introduction

This paper provides a simple theoretical framework describing the links between investment, internal finance, and external finance. The model is developed on the assumption that a fixed share of the financial resources generated by industrial corporations is paid out to shareholders as dividends, while the remaining is used to finance investment, or alternatively is discretionally paid out when expected returns from investment opportunities are poor. Expected returns on investment, as captured by

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Tobin's  $q$ , being forward-looking, are not necessarily always in line with generated cash flows, so that the optimal desired investment may require an amount of financial resources larger than the quantity available, which has to be obtained from external sources. External finance is costly, particularly if a substantial amount of resources has to be gathered in a short period of time. As such, it is raised only to fill the gaps between desired levels of investment and internally generated funds available. In this framework the dynamic properties of financial flows play an important role in the dynamics of investment, since financial costs induce industrial firms to smooth investment over time not only to minimize adjustment cost on the stock of capital, but also to minimize the cost of adjusting the stock of external finance.

The standard approach followed to investigate the relevance of financial frictions on investment relies on the use of micro-level data, on the ground that different classes of industrial firms are likely to face different financial constraints. Implicit in this approach is the belief that macro-level data provide little information content, since the behavior of individual firms is averaged out in the process of aggregation. The literature so far has obtained important results, using panel data estimates. In particular, it is now well established that cash flows have strong explanatory power beyond average  $q$  in investment regressions, a finding usually interpreted as evidence of the relevance of the financing constraints facing firms. However, this evidence has been challenged by a number of studies which show that cash flows may be significant in investment regressions even in the absence of financial frictions.<sup>1</sup>

Recent works on the role of financial constraints, however, such as [Jermann and Quadrini \(2012\)](#), make use of aggregate data to exploit the availability of long time-series and to study the dynamic properties of investment, average  $q$ , and cash flows. These dynamics are important, as all these series are extremely persistent. We follow a similar approach by studying quarterly data from the Flow of Funds Financial Accounts of the United States, focusing on figures for non-financial corporations, over a long time span covering the period 1952–2013. We depart from [Jermann and Quadrini \(2012\)](#) by choosing data for non-financial corporations instead of non-financial businesses, to work with a relatively homogeneous aggregate, as investment from non-financial corporations represents 87 percent of the total. These data allow us to derive a new set of insights not available under the traditional approach. We find, in fact, that financial frictions are strongly significant even in spite of the aggregation issues and for an aggregate where large firms, in principle subject to weaker financial constraints, play an overwhelming role. Our evidence thus complements the results obtained in the literature based on panel data. In contrast with most of the existing literature, we test the relevance of financial frictions in the environment that *a priori* is expected to be more challenging. A finding that these frictions are significant is thus quite robust.

The following charts provide a visual insight of the above stylized facts. [Fig. 1](#) displays a four periods moving average for the series of dividends distributed and the series of internally generated financial flows. [Fig. 2](#) depicts the series of internally generated financial flows and investment whereas [Fig. 3](#) sets out the series for the external finance raised together with investment.<sup>2</sup> The three diagrams show that the series under scrutiny strongly co-move over time. For instance, their pairwise correlations calculate, respectively, to 0.70, 0.55 and 0.61.<sup>3</sup>

The distinctive feature of our model is the specification of a functional form for the financing constraints, so that it becomes possible to study the dynamic properties of the variables involved.<sup>4</sup> More specifically, we argue that when the cost of external finance is convex because of information costs, it generates additional adjustment costs on the stock of capital, on top of those usually assumed.

<sup>1</sup> See, for instance, [Abel and Eberly \(2011\)](#), [Gomes \(2001\)](#) and [Hayashi and Inoue \(1991\)](#).

<sup>2</sup> All the above series are expressed as a percentage of the book value of capital and they are taken from the Flow of Funds Accounts of the United States for non-financial corporations.

<sup>3</sup> The correlation of 0.70 would be higher for annual data. In fact, the volatility of dividends around the year 2005 was a quickly reverted, temporary phenomenon that does not emerge on annual figures.

<sup>4</sup> [Gomes \(2001\)](#) has introduced costly financing for firms in a general equilibrium framework, but leaving the model as general as possible, and imposing restrictive assumptions in the calibration process. A similar strategy allows to analyze the impact of financial constraints on firms returns, and it emerges that financially constrained firms have larger stock returns (see [Gomes, Yaron, and Zhang \(2006\)](#) and [Whited and Wu \(2006\)](#)).

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