

Chapter 1

Introduction

Investment expenditure is one of the most volatile elements of the aggregate economy. In the long run, capital accumulation plays a critical role in productivity and economic growth. And from the perspective of policy intervention, investment is also a key issue for both monetary policy and fiscal policy.

In order to understand the behavior of aggregate investment, it is important to understand factors that affect investment at the firm level. Financing constraints may limit firms' access to external finance and make them unwilling or unable to invest unless internal finance is available. It is therefore important to study to what extent and how financing constraints affect firms' investment behavior.

The study of this topic is also interesting for theoretical reasons. First, a puzzle in the investment literature is that measures of Tobin's Q explain very little of variation in investment and financing constraints may provide one explanation. Second, microeconomic interest in the presence of financing constraints relates to the consequences of informational imperfections, either between owners and managers of the firms, or between borrowers and lenders in the credit market. Third, macroeconomic interest relates to the importance of the "financial accelerator" mechanism, which suggests that capital market imperfections may lead to significant business cycle fluctuations by propagating relatively small initial shocks.

To test the possibility that firms' investment is subject to financing constraints, there has been a lot of empirical research studying the interaction between investment and financial decisions with firm-level data. Following Fazzari, Hubbard and Peterson (1988), much of this literature adds a cash flow variable to a standard Q model of investment, and investigate the sensitivity of investment to cash flow in this framework for difference sub-samples of firms. A common finding is that stronger correlation between

1. Introduction

investment and cash flow for sub-samples that are considered more likely to face financing constraints. This finding has often been cited as evidence of significant capital market imperfections and the existence of a financial accelerator mechanism.

However, a more recent and active literature has questioned whether the sensitivity of a firm's investment to its own cash flow provides a useful indicator of financing constraints. Even under perfect capital markets, cash flow sensitivity may result from measurement error in Tobin's Q (Erickson and Whited, 2000) or from other forms of model mis-specification (Cooper and Ejarque, 2003). Under imperfect capital markets, stronger cash flow sensitivities could be found for firms subject to less severe financing constraints (Kaplan and Zingales, 1997). Hence, the relationship between investment-cash flow sensitivity and financing constraints is now one of the most controversial debates in the investment literature.

In this thesis, we investigate this issue using both real investment data and simulated data from a calibrated dynamic model for optimal investment and financial decisions. We study under what conditions and to what extent the observed cash flow sensitivity in empirical studies could provide a useful indicator of financing constraints.

Our contribution is following. First, we present an econometric analysis of investment behaviour using a recently released dataset for Chinese manufacturing firms. Since these firms are not publicly traded, no stock market information can be used to construct a measure of Tobin's Q. Hence we adopt a reduced form dynamic investment equation with an error-correction specification, rather than the Q model. An important advantage of this dataset is that the managers of firms were specifically asked as part of the survey what they would do if they received a windfall injection of cash. Around half of the firms responded that they would use this to finance additional investment, suggesting that their investment may be affected by binding financing constraints. We compare the actual investment behavior of this sub-sample to the investment behavior of the other firms. Preliminary results suggest that significant investment-cash flow sensitivity is found only for the sub-sample whose survey response is consistent with being financially constrained.

In addition, the thesis uses simulated investment data from calibrated structural models to evaluate this empirical specification. We solve these models by numerical dynamic programming methods and generate artificial firm-level datasets, both under the null hypothesis of perfect capital markets and under an alternative with a form of capital market imperfections, in which external finance is more costly than the use of internal funds. These experiments provide a useful data generating process in which we can correctly identify constrained and unconstrained firms, and construct a correct measure of marginal Q. Then we investigate the role of financing constraints and their implications for the performance of empirical investment equations, both the standard Q model and the reduced form investment model.

The main findings of this thesis include: first, if adjustment costs are quadratic and firms finance investment by issuing new equity with a fixed cost premium per unit of new equity issued, cash flow sensitivity in the structural Q model is a necessary and sufficient indicator of financing constraints, using a correct measure of marginal Q. Second, however, if there is divergence between average Q and marginal Q; measurement error in marginal Q; or heterogeneity across firms in the level of adjustment costs, we can replicate positive significant cash flow sensitivities similar to those found in empirical studies even in the absence of financing constraints. Third, we show that a reduced form model provides a reasonable approximation to the underlying investment decision rule, but the specification used in the previous literature may be mis-specified due to the omission of relevant non-linear terms. Fourth, the omission of these non-linear terms can result in significant coefficients on cash flow, even in the absence of capital market imperfections. Indeed, when we allow for these non-linear terms in our empirical study, we find no significant evidence of investment-cash flow sensitivity, even for the sub-sample of firms whose survey responses suggested that they could be financially constrained.

The thesis is organized as follows. In Chapter 2 we review the recent controversies about the role of cash flow variables in the standard Q model. Chapter 3 reports our empirical findings based on a reduced form investment model with firm-level panel data for Chinese manufacturing firms. In Chapter 4 we construct and solve a dynamic programme for optimal investment under

1. Introduction

perfect capital markets. We then evaluate the standard Q model with simulated investment data generated from this model. Chapter 5 develops an alternative model with a form of capital market imperfection and examines its implications for results based on the Q model. Chapter 6 relates the reduced form error-correction model to the investment decision rule in these structural models, and uses the simulated data to evaluate tests of cash flow sensitivity based on this reduced form model. We then use the results to re-evaluate our empirical findings in chapter 3. Chapter 7 concludes and presents some suggestions for further research.