# Non-convex adjustment costs and financing constraints in Japanese firm investment

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## Abstract

Traditional $Q$ theory insists that the dynamics of firm investment becomes smooth. This prediction of the model is not consistent to actual data in many cases. To solve this shortcoming, recent research has progressed in two directions. One is about the nature of capital adjustment costs and the other is about financing constraints. Despite the importance of both factors, there is only a limited number of attempts to integrate them.

This paper examines the effects of non-convex adjustment costs and financing constraints on firm investment using Japanese firm panel data. I formulate the model in imitation of the one used in Whited(1992) and Cooper, Haltiwanger and Willis(2010) and estimate this structural model using generalized method of moment technique. I conduct estimation in five industries: machinery, electricity, motor and trasport equipment, chemicals, steel. The result is as follows. First, from the esimation of profit function, I confirm the existence of non-convex adjustment costs in two industries: machine and chemicals. Second, from the esimation of the investment Euler equation, I observe the existence of financing constraints in all industries. Third, I find that the convex adjustment costs are estimated small and that this result supports the model introduced in Wang and Wen(2012). To be concrete, firms can adjust their capital stock instantaneously and their desired level of capital stock is determined by the quantities which firms can borrow.

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