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Wait-and-see: Investment options under policy uncertainty

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ABSTRACT

This paper develops a model of investment decisions in which uncertainty about a one-time change in tax policy induces the firm to temporarily stop investing—to adopt a wait-and-see policy. After the uncertainty is resolved, the firm exploits the tabled projects, generating a temporary investment boom.

1. Introduction

This paper develops a model of investment decisions in which uncertainty about a one-time change in tax policy induces the firm to temporarily stop investing—to adopt a wait-and-see policy. The basic idea is that uncertainty about a future tax rate creates uncertainty about the profitability of the investment. If the uncertainty is likely to be resolved in the not-too-distant future, the firm rationally delays committing resources to irreversible projects. After the uncertainty is resolved, the firm exploits the tabled projects, generating a temporary investment boom. The size of the boom depends on the realization of the fiscal uncertainty, with lower realizations of the tax rate producing larger booms.

This type of delay may help explain the severity of some recessions. For example, during the early years of the Great Recession there was a great deal of uncertainty about the form and cost of health care reform, as well as other aspects of tax policy. The decline in investment over this period was significantly steeper and more prolonged than during other post-war recessions, and uncertainty about fiscal policy may have been a contributing factor. For another example, Shlaes (2009) argues uncertainty about policy was important during the Great Depression, while Field (2003) offers evidence that many new inventions were accumulated during the 1930s: products and processes were discovered but not immediately implemented. The argument applies to other types of policies as well. Uncertainty about a major tariff reform or a substantial devaluation of the exchange rate could produce similar effects in an economy where international trade is important.

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In the model studied here investment has two inputs, projects and cash. Projects can be thought of as specific investment opportunities, as in McDonald and Siegel (1986) and Jovanovic (2009). For a retail chain or a service provider, projects might be cities or locations where new outlets could be built. For a manufacturing firm, a project might be the construction of a new plant. For a real estate developer, a project might be a parcel of land that could be built on. The key feature of a project is that it is an investment opportunity not freely available to others: it is exclusive to one particular investor, or likely to be so. This feature is important in generating delay: the investor is willing to wait because—at least with high probability—the opportunity will still be available later.

Both projects and liquid assets can be stored, and a "wait-and-see" policy—delay—is defined as a situation where the stocks of both projects and cash are positive. When is delay an optimal strategy? Proposition 4, the main result of the paper, answers this question: an optimal response to uncertainty about future policy *always* involves a period of delay. That period is short if the extent of uncertainty is small, and it does not begin immediately if the uncertainty is in the distant future, but delay is always part of the optimal strategy. Perfectly anticipated policy changes, on the other hand, may lead investors to accumulate one input or the other, but not both.

The rest of the paper is organized as follows. The related literature is discussed in Section 2, and Section 3 provides an overview of the model. In Section 4 the model is described in more detail, and the transition after the tax change is studied. Section 5 analyzes the firm's strategy before the tax change. The main result is Proposition 4, which shows that uncertainty about the new tax policy necessarily leads to delay. Section 6 extends the model to allow a Poisson arrival date, and Proposition 5 shows that the main result carries over, provided the arrival rate is not too small. Section 7 contains a numerical example, and Section 8 concludes. All proofs are in Appendix A, and Appendix B describes the computational procedure.

2. Related literature

The literature on investment under uncertainty is vast. The model here is most closely related to four strands of it.

The first strand consists of early papers that look at decisions about one or more investment projects, studying various types of uncertainty. The decision is about when to exercise an option.

In an early contribution Cukierman (1980) looks at the decision problem of a firm whose single project is characterized by an unknown scale parameter, drawn from a known distribution. Each period the firm receives a signal about the parameter and updates its beliefs. The firm must decide when to invest—how long to wait and receive more information—and how much to invest. The paper shows that an increase in the variance of the distribution from which the parameter is drawn (weakly) increases the number of periods that investment is delayed.

Bernanke (1983) studies a dynamic inference model, in which investment opportunities arrive every period and the underlying distribution from which these are drawn is, at random dates, replaced with a new one. When this happens, investors learn about it slowly, by observing the outcomes of previous investment decisions. Therefore, after a switch occurs there is likely to be at least one period when investors are very uncertain which distribution is in place. The paper provides an example in which the switch from one distribution to another necessarily produces at least one period in which investors adopt a "wait and see" strategy and no investment takes place.

McDonald and Siegel (1986) return to the decision problem of a firm with a single potential investment project. The expected net return from the project evolves over time according to a known stochastic process, and the option to invest expires at a finite date T. Thus, the firm's problem involves a tradeoff between waiting for the net return to grow, and risking that it will shrink. The optimal strategy consists of a return threshold that declines over time, and the optimal strategy is to invest at the first date when the expected return meets or exceeds the threshold.

A successor to these contributions is the model in Pindyck (1988), which looks at a firm with an infinite sequence of "growth options" in an environment with ongoing demand shocks. At each instant the firm decides whether to exploit an option, with each project yielding one unit of capital. Investment is irreversible, and if future demand is insufficient to cover operating costs, excess capital is idle.

All of these contributions involve decisions about when to exercise an option. By contrast, the present paper studies the decision to create options that can be exercised later. The firm receives a constant stream of projects, and the decision is about when to stop investing and instead hold projects for future investment. The uncertainty is about a one-time event, and all of the accumulated options are exercised when the uncertainty is resolved.

The present paper is also closely related to a second strand of the investment literature, which obtains periods of inaction and times of lumpy investment as outcomes. A classic paper here is Abel and Eberly (1994), which extends the earlier models of investment under uncertainty to include fixed costs, irreversibility, and a wedge between the purchase and sale prices of capital. The uncertainty takes the form of a shock to profitability, a combination of demand and cost shocks. The result is a model with an inaction region and, if fixed costs are present, lumpy investment decisions.

Models with fixed costs and lumpy adjustment have also been used to study a wide variety of specific questions about business investment, as well as questions about demand for housing and other consumer durables, and business hiring decisions.[2] Bertola and Caballero (1990) extend the investment model to look at its aggregate implications, and Thomas (2002) asks whether lumpy adjustment at the firm level changes the properties of a standard real business cycle model.

[2] See Dixit and Pindyck (1994) and Stokey (2008) for more detailed discussions of this literature.

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