Firm Dynamics

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Firm Dynamics

There are a number of firm decision that involve dynamic (intertemporal) choices:

- Capital: costs to adjusting capital stock (production disruptions, training, installation, etc)
- Labor: costs to adjusting labor (e.g., training, search, etc)
- Price: menu costs $\rightarrow$ costs to adjusting prices
- Inventories (for finished and intermediate goods)
- Organizational capital (knowledge and general operation of facilities)

What are we studying?

We'll focus on models where firms choose the optimal level of capital

- Useful for studying:
  1. Investment behavior (e.g., responses to fiscal or monetary policy changes)
  2. Corporate financing behavior (e.g., corporate capital structure decisions, investment in the face of financing constraints)
  3. Asset pricing (e.g., the investment capital asset pricing model)

Investment behavior

Bachmann, Caballero, and Engel (*American Economic Journal: Macroeconomics*, 2013)

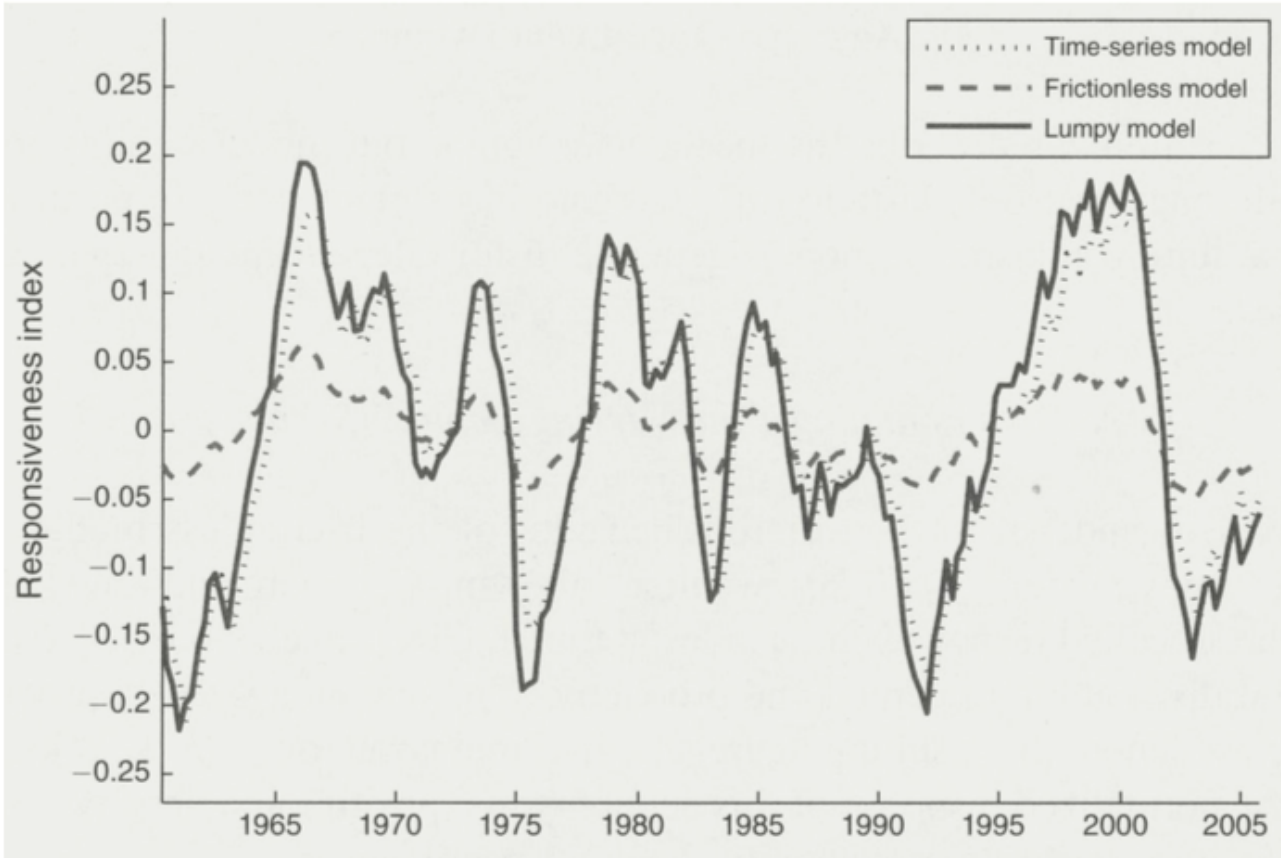


FIGURE 3. TIME PATHS OF THE RESPONSIVENESS INDEX

Notes: This figure plots the evolution of the quarterly responsiveness index for the 1960–2005 period (in log deviations from its average value). The solid and dashed lines represent the index for the lumpy ($\chi = 0.50$) and frictionless models, while the dotted line represents the index for the ARCH-type time series model.

Fiscal Policy (1)

Chetty and Saez (*Quarterly Journal of Economics*, 2005)

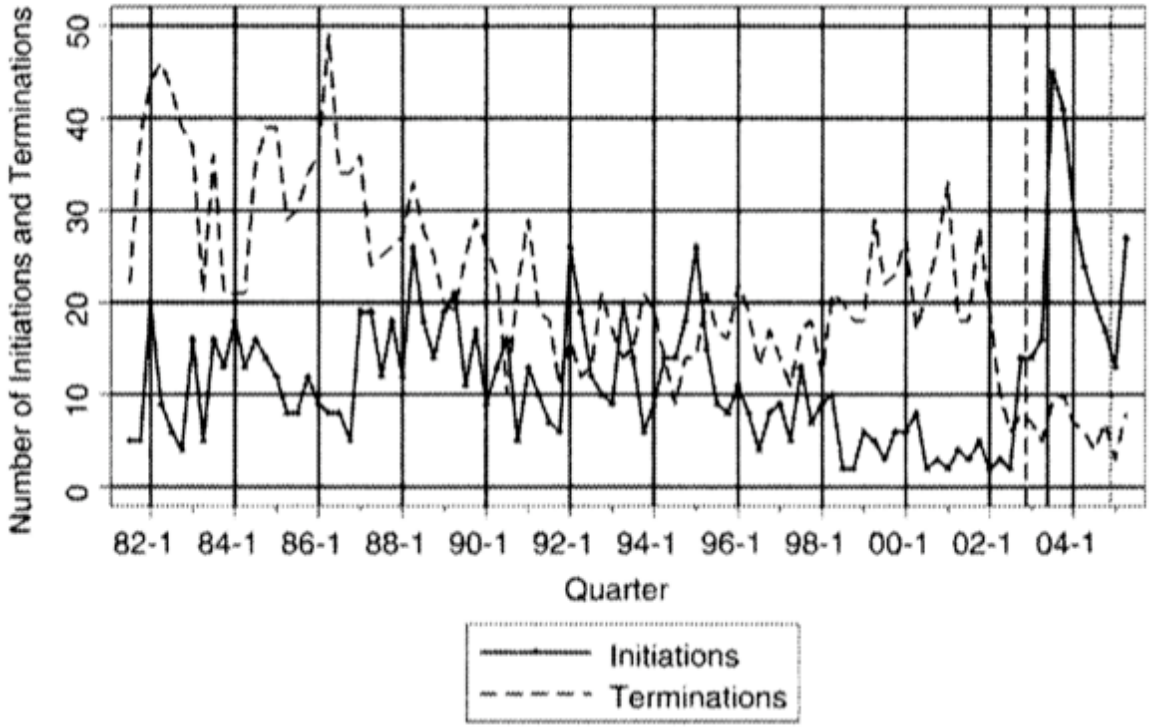
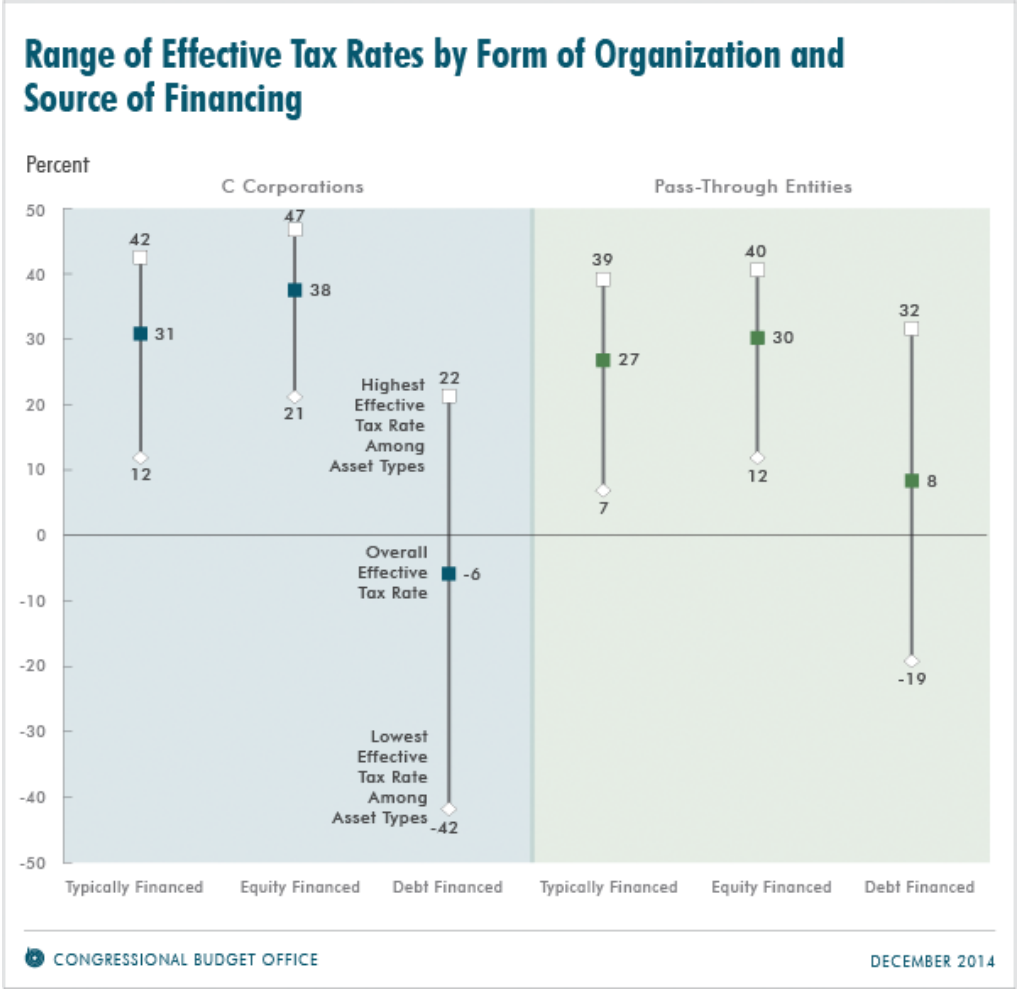


FIGURE 2. DIVIDEND INITIATION AND TERMINATION

Notes: Initiation is defined as starting to pay regular dividends after having been in the sample, and not paying regular dividends for at least four quarters. Termination is defined as stopping regular dividend payments for at least four quarters.

Fiscal Policy (2)



Aggregate Fluctuations

Gabaix (*Econometrica*, 2011)

Econometrica, Vol. 79, No. 3 (May, 2011), 733–772

THE GRANULAR ORIGINS OF AGGREGATE FLUCTUATIONS

BY XAVIER GABAIX[1]

This paper proposes that idiosyncratic firm-level shocks can explain an important part of aggregate movements and provide a microfoundation for aggregate shocks. Existing research has focused on using aggregate shocks to explain business cycles, arguing that individual firm shocks average out in the aggregate. I show that this argument breaks down if the distribution of firm sizes is fat-tailed, as documented empirically. The idiosyncratic movements of the largest 100 firms in the United States appear to explain about one-third of variations in output growth. This "granular" hypothesis suggests new directions for macroeconomic research, in particular that macroeconomic questions can be clarified by looking at the behavior of large firms. This paper's ideas and analytical results may also be useful for thinking about the fluctuations of other economic aggregates, such as exports or the trade balance.

KEYWORDS: Business cycle, idiosyncratic shocks, productivity, Solow residual, granular residual.

Optimal Corporate Capital Structure

Hennessy and Whited (*Journal of Finance*, 2005)

THE JOURNAL OF FINANCE • VOL. LX, NO. 3 • JUNE 2005

Debt Dynamics

CHRISTOPHER A. HENNESSY and TONI M. WHITED*

ABSTRACT

We develop a dynamic trade-off model with endogenous choice of leverage, distributions, and real investment in the presence of a graduated corporate income tax, individual taxes on interest and corporate distributions, financial distress costs, and equity flotation costs. We explain several empirical findings inconsistent with the static trade-off theory. We show there is no target leverage ratio, firms can be savers or heavily levered, leverage is path dependent, leverage is decreasing in lagged liquidity, and leverage varies negatively with an external finance weighted average Q. Using estimates of structural parameters, we find that simulated model moments match data moments.

Asset Pricing

Li, Livdan, and Zhang (*Review of Financial Studies*, 2009)

Anomalies

Erica X. N. Li
University of Michigan

Dmitry Livdan
University of California, Berkeley

Lu Zhang
University of Michigan and National Bureau of Economic Research

We take a simple q-theory model and ask how well it can explain external financing anomalies, both qualitatively and quantitatively. Our central insight is that optimal investment is an important driving force of these anomalies. The model simultaneously reproduces procyclical equity issuance waves, the negative relation between investment and average returns, long-term underperformance following equity issues, positive long-term drift following cash distributions, the mean-reverting operating performance of issuing and cash-distributing firms, and the failure of the CAPM in explaining the long-term stock-price drifts. However, the model cannot fully capture the magnitude of the positive drift following cash distributions observed in the data. (*JEL* D21, D92, E22, E44, G12, G14, G31, G32, G35)

Computational tools:

- Value function iteration for solving continuous dynamic programming problems
- Value function iteration for solving discrete dynamic programming problems
- Approximating autoregressive processes with Markov chains
- Fixed point algorithms to solve general equilibrium models
- `Numba`

Roadmap

- The basic firm problem
  - The setup
  - Without dynamics
  - Adding dynamics
    - Modeling convex and non-convex costs of adjustment
  - Computational solution
  - Adding uncertainty
- q-Theory of investment
- Heterogeneous firms in general equilibrium
  - Finding the stationary distribution
  - Relating households and firms
  - General equilibrium solution algorithm

Economic Modeling

All economic models should specify:

1. The environment (underlying stuff of the economy)
   - Population of agents
   - Preferences
   - Productive technology (e.g. How do we produce output? Whats feasible?)
   - Information technology (e.g. Who knows what? When?)
   - Enforcement technology (e.g. How are property rights enforced?)
   - Matching technology (e.g. How do people meet?)
2. Equilibrium concept (this will determine allocations)
   - Non-cooperative game (SPNE, Ramsey eq., etc)
   - Competitive (Walrasian eq.)
   - Planners solution

Firm Model - Environment

We'll start simple, but modeling a single firm without uncertainty

- Population of agents
  - A single firm who purchases capital and hires labor to produce output
  - Capital and labor supplied inelastically
  - Output demanded inelastically
- Preferences
  - The objective of the firm is to maximize the discounted present value of profits
- Productive technology
  - Per period profit function: $\pi(z,k) = \max_l R(z,k,l) - wl$
  - R= Revenues $= p * q(z,k,l)$
  - Normalize $p = 1$
  - $q(z,k,l) = zk^{\alpha_k} l^{\alpha_l}$

Firm Model - Environment (cont'd)

- Information technology
  - Deterministic, perfect foresight
- Enforcement technology
  - No enforcement issues - perfectly enforced property rights
- Matching technology
  - All buyers an sellers together in one big market (for all markets - capital, labor, output)

Firm Model - Equilibrium

- **Equilibrium Concept**
  - Partial equilibrium
  - Firm optimally chooses labor, capital, and output to maximize profits, taking prices as given
  - Will extend to general equilibrium later.