Final Paper plan in Nov, 2022

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1. Study Question & Motivation
2. Estimation of Production Function with Variable Parameters
   - Select the Function
   - Decomposition of Aggregate Factor
   - Industry/Sector Classification
   - Time-Series Change and Factor Scale
   - Estimates of markup rate
3. Estimation of Cost Function Independently
   - Select the Function
   - Estimation the factors price
4. Causal Inference between M&A and Factor Productivity
5. Consideration of Time-Series Relationship between Capital and Labor
6. Data

My Study Question

- Can labor and non-labor capital co-exist in economic activity?
- What M&A brings to firms' and industries' production?

Study Background

- aaa

In this phase, I choose a type of production function, considering the function characteristics and the relation to the next section and beyond.

- CES : $\boldsymbol{Y} = \boldsymbol{F} \cdot \left[\sum_{i}^{n} a_i \boldsymbol{X_i}^r \right]^{\frac{1}{r}}$
  - ◯ Easy to determine the substitute/complementary relation among various factors and appropriate production function
  - △ Difficult to use for time-series changes because the elasticity of substitution between factors is assumed to be constant
- Cob-Douglas : $\boldsymbol{Y} = \gamma \prod_{i}^{n} \boldsymbol{X_i}^{\alpha_i}$
  - ◯ Tractable
  - △ Difficult to use for time-series changes because the elasticity of substitution between elements is strongly assumed to always be 1

- Trans-Log : $\ln \boldsymbol{Y} = \alpha_0 + \sum_i^n \alpha_i (\ln \boldsymbol{X_i}) + \frac{1}{2} \sum_i^n \sum_j^n \beta_{ij} (\ln \boldsymbol{X_i})(\ln \boldsymbol{X_j})$
  - ◯ Suitable for measuring time-series changes because it makes no a priori assumptions about the elasticity of substitution of elements
  - △ Awkward
- Linear : $\boldsymbol{Y} = \sum_i^n \alpha_i \boldsymbol{X_i}$
- Leontief : $\boldsymbol{Y} = min\{\frac{\boldsymbol{X_1}}{\alpha_1}, \cdots, \frac{\boldsymbol{X_n}}{\alpha_n}\}$
  - ◯ Tractable
  - △ Very restrictive and limited number of cases

Reference

- 生産関数推定について：手法に関する考察と規制緩和への示唆（中村豪）
- 2 段階 CES 型生産関数の計測と誘発的技術変化仮説の検証（川越俊彦）
- フレキシブル関数の理論（浜口登）
- 要素代替の弾力性（宮澤和俊）
- トランス・ログ型関数による航空輸送産業の費用構造の分析（衣笠達夫）
- Decomposition of Aggregate Productivity Growth with Unobserved Heterogeneity（笠原博幸、西田充邦、鈴木通雄）

Labor Capital

- Education
  - High-Educated/Skilled
  - Low-Educated/Unskilled
- Employment
  - Contract Type
    - Permanent
    - Contract
    - Part-Time
  - Career
    - Proper
    - Job-Changer
    - Loaned Staff

Non-Labor Capital

- Liquidity
  - Fixed Assets
  - Current Assets
  - Deferred Assets
- Tangibility
  - Tangible Assets
  - Intangible Assets

I wanna classify firms/Corporation into some Industry or Sector with easy and versatile ways. Some classification-criteria candidates are as following;

- S&P Dow Jones Indexes(GICS)
  - GICS for Japan Market ver. 2022
- 日経業種分類
- 日本標準産業分類
- Other ways & reference

In this phase, I organize the time-series changes of parameters of production function and the time-series trends of abstract/relevant amounts for each production factors.

Referring to 生産関数を用いたマークアップ率の計測に関する検証（中村豪）, I measures the markup rate and its relation with production parameters for each industries/sectors.

In this section, I estimate the Cost Function independently of production function with same factors.
The reference is as following;

- 国立大学の費用関数: トランスログ・コストシェアモデルによる同時推定（北坂真一）

- 実証分析における生産，費用関数（中西泰夫）

In this phase, I will estimate the factor price with cost function estimate above or IO-table if possible.

- In the former paper written with seminar members, we investigated why M&A.
- In this paper, I study what M&A brought to firms' production/productivity with statistic causal inference.
- At last, I will study the connection between M&A and firms'/Sector or industry's markup.

Based on the aforementioned study, I put my own answers to my study questions.

- Human labor and non-labor capital are substitute? or complementary?
- How No. of entries and exit of companies and decrease No. of companies in a market affects their productivity or labor-capital relation?

- Bloomberg
- DBJ
- Nikkei needs
- IO table